

A PROJECT MANAGEMENT REQUIREMENTS

A1 Title and Approval Sheet

Document Title: NHDES Volunteer Lake Assessment Program Generic QAPP

Lead Organization: New Hampshire Department of Environmental
Services, Biology Section

Preparer's Name: Andrea M. LaMoreaux, VLAP Coordinator

Organizational Affiliation: NH Department of Environmental Services

Address: 6 Hazen Drive, PO Box 95
Concord, NH 03302-0095

Preparation Date (month/day/year): November 27th, 2002

Project Manager:

Signature / Date
Jody Connor, Limnology Center Director and
VLAP Program Manger, NHDES

Project Coordinator:

Signature / Date
Andrea LaMoreaux, VLAP Coordinator, NHDES

Project QA Officer:

Signature / Date
Andrew Chapman, NHDES

NHDES Quality Assurance Manager

Signature / Date
Vincent R. Perelli, NHDES

USEPA NE Project Officer:

Signature / Date
Alan Peterson (or authorized QA Officer)

Note: This review is not required since this project receives only
state funding and does not receive EPA funding,
however, we are requesting EPA review

USEPA NE QA Manager

Signature / Date
Gerry Sotolongo (or authorized QAU representative)

Document control number: [USEPA will provide](#)

US EPA Region I

A2 TABLE OF CONTENTS
Volunteer Lake Assessment Program Generic QAPP
New Hampshire Department of Environmental Services

A	PROJECT MANAGEMENT REQUIREMENTS	1
A1	Title and Approval Sheet	1
A3	Distribution List and Project Personnel Sign-Off Sheet	8
A3.1	Distribution List	8
A3.2	Project Personnel Sign-off Sheet	9
A4	Project Organization	10
A4.1	Project Organization Description	10
A4.2	Organization Chart	11
A5	Problem (Program) Definition/Background	12
A6	Project (Program) Task Description	13
A6.1	Project (Program) Purpose	13
A6.2	Project (Program) Sampling Tasks	13
A6.3	Project (Program) Schedule Timeline	21
A7	Quality Objectives and Criteria	23
A7.1	Program Quality Objectives	23
A7.2	Measurement Performance Criteria	26
A8	Special Training/Certification	29
A8.1	Personnel Responsibilities and Qualifications	29
A8.2	Special Training Requirements/Certification	29
A9	Documents and Records	32
A9.1	Communication Pathways	32
A9.2	Modifications to Approved QAPP	32
A9.3	Sampling and Analysis Plans	34
A9.4	Project Documentation and Records	34
A9.5	Field Analysis Data Package Deliverables	35
A9.6	Fixed Laboratory Data Package Deliverables	35
A9.7	Data Reporting Formats	35
B	DATA GENERATION AND ACQUISITION ELEMENTS	37
B1	Sampling Process Designs (Experimental Design)	37
B1.1	Types and Number of Samples Required	37
B1.2	Sampling Locations and Frequencies	38
B1.3	Sample Matrices	38
B1.4	Measurement Parameters of Interest	39
B2	Sampling Methods	46
B2.1	Sample Collection Methods	46
B2.2	Cleaning and Decontamination of Equipment/Sample Containers	47
B2.3	Sample Preparation and Holding Times	47

B2.4	Performance Requirements for Sampling Methods	47
B3	Sample Handling and Custody	51
B3.1	Sample Collection Documentation	51
B3.2	Sample Handling and Tracking System	51
B3.3	Sample Custody	56
B4	Analytical Methods	56
B4.1	Field Analytical Methods and Equipment Required	56
B4.2	Fixed Analytical Methods and Equipment Required	56
B4.3	Laboratory Decontamination Procedures and Materials	57
B4.4	Waste Disposal Requirements	57
B4.5	Specific Performance Requirements	57
B5	Quality Control	58
B5.1	Sampling Quality Control	58
B5.2	Field Analytical Quality Controls	58
B5.3	Fixed Laboratory Quality Controls	58
B6	Instrument/Equipment Testing, Inspection, and Maintenance	70
B6.1	Field Instrument/Equipment Testing, Inspection, and Maintenance	71
B6.2	Fixed Laboratory Instrument/Equipment Testing, Inspection, and Maintenance	71
B7	Instrument/Equipment Calibration and Frequency	72
B7.1	Field Equipment Calibration	72
B7.2	Laboratory Equipment Calibration	72
B8	Inspection/Acceptance of Supplies and Consumables	74
B8.1	Standard materials and solutions, reagents, hoses, deionized water, electronic data storage media	74
B8.2	Sample Bottles	74
B9	Non-direct Measurements	74
B10	Data Management	75
B10.1	Project Data Management Process	75
B10.2	Data Handling and Management Procedures	76
B10.3	Data Tracking and Control	78
C	ASSESSMENT AND OVERSIGHT	80
C1	Assessments and Response Actions	80
C1.1	Planned Assessments	80
C1.2	Assessment Findings and Corrective Actions	80
C1.3	Additional QAPP Non-Conformances	81
C2	Reports to Management	84
D	DATA VALIDATION AND USABILITY	86
D1	Data Review, Verification, and Validation	86
D2	Verification and Validation Methods	86
D3	Reconciliation with User Requirements	90
D3.1	Data Review	90

D3.2 Data Limitations and Actions _____ 91

LIST OF TABLES

Table A3-1: Distribution List _____	8
Table A3-2: Project Personnel Sign-Off Sheet (NHDES) _____	9
Table A3-3: Project Personnel Sign-Off Sheet (VLAP Satellite Laboratories) _____	9
Table A6-1: Contaminants of Concern and Other Target Analytes Table _____	14
Table A6-2: Field and Quality Control Sample Summary Table _____	18
Table A6-3: Analytical Services Table _____	19
Table A6-4: Project Schedule Timeline (NHDES) _____	21
Table A6-5: Project Schedule Timeline (VLAP Satellite Laboratories) _____	22
Table A6-6: Project Schedule Timeline (Volunteer Monitors) _____	22
Table A7-1: Measurement Performance Criteria Table for Surface Water Samples _____	28
Table A8-1: Personnel Responsibilities and Qualifications _____	29
Table A8-2: Special Training Requirements for NHDES Laboratory Interns _____	30
Table A8-3: Special Training Requirements for Satellite Laboratory Interns _____	30
Table A8-4: Special Training Requirements for Volunteer Monitors _____	31
Table A9-1: Updated QAPP Project and Sampling Analysis Plan Personnel Sign-Off Sheet (NHDES) _____	33
Table A9-2: Updated QAPP Project and Sampling Analysis Plan Personnel Sign-Off Sheet (Satellite Laboratories) _____	33
Table A9-3: Project Documentation and Records Table _____	34
Table B1-1: Sample Location, Sampling and Analysis Methods/SOP Requirements _____	40
Table B2-1: Project Sampling SOP Reference and Equipment _____	46
Table B2-2 Performance Requirements for Sampling Methods and Corrective Actions _____	47
Table B4-1: Field Analytical Method/SOP Reference Table _____	56
Table B4-2: Fixed Laboratory Analysis Analytical Method/SOP Reference Table _____	56
Table B5-1: Field QC Samples and Frequency Table _____	59
Table B5-2: Field Analytical QC Sample Table for Dissolved Oxygen (NHDES) _____	60
Table B5-3A: Fixed Laboratory Analytical QC Sample Table for Total Phosphorus (DES Laboratory Services) _____	61
Table B5-3B: Fixed Laboratory Analytical QC Sample Table for Total Phosphorus (VLAP Satellite Labs) _____	62
Table B5-3C: Fixed Laboratory Analytical QC Sample Table for pH (NHDES Limnology Center and Satellite Labs) _____	63
Table B5-3D: Fixed Laboratory Analytical QC Sample Table for ANC (NHDES Limnology Center and Satellite Labs) _____	64
Table B5-3E: Fixed Laboratory Analytical QC Sample Table for Conductivity (NHDES Limnology Center and Satellite Labs) _____	65
Table B5-3F: Fixed Laboratory Analytical QC Sample Table for Turbidity (NHDES Limnology Center and Satellite Labs) _____	66
Table B5-3G: Fixed Laboratory Analytical QC Sample Table for Chlorophyll-a (NHDES Limnology Center and Satellite Labs) _____	67
Table B5-3H: Fixed Laboratory Analytical QC Sample Table for Plankton (NHDES Limnology Center) _____	68

Table B5-3I: Fixed Laboratory Analytical QC Sample Table for E.coli (NHDES and VLAP Satellite Laboratories)	69
Table B6-1: Field Equipment Maintenance, Testing and Inspection	71
Table B6-2: Fixed Laboratory Equipment Maintenance, Testing and Inspection	71
Table B7-1: Field Analytical Instrument Maintenance and Calibration Table	72
Table B7-2: Fixed Laboratory Analytical Instrument Maintenance and Calibration Table	73
Table B10-1: Data Representation in VLAP “Bi-Annual Reports” and “Interim Reports”	77
Table C1-1: Project Assessment Table	82
Table C2-1: NHDES Limnology Center Annual QA/QC Report Distribution List	85
Table D2-1: Data Verification Process	87
Table D2-2: Data Validation Summary Table	88
Table D2-3: Data Validation Modifications	90
EPA-NE QAPP Worksheet 2	93

LIST OF FIGURES

Figure A4-1: Organization Chart for the NHDES Volunteer Lake Assessment Program	11
Figure A5-1: Volunteer Lake Assessment Program Participation 1985 - 2001	12
Figure B3-1: NHDES Limnology Center Sampling Handling/Tracking/Custody Summary Flow Diagram	55
Figure B3-2: NHDES VLAP Satellite Laboratory Sampling Handling/Tracking/Custody Summary Flow Diagram	55

LIST OF APPENDICIES

Appendix A: NHDES VLAP Background Information

- A-1: VLAP Fact Sheet
- A-2: VLAP Lakes and Volunteers (2001 Sampling Season)

Appendix B: Special Training/Certification Requirements

- B-1: NHDES Staff Supplemental Job Descriptions
- B-2: Resumes for VLAP Satellite Laboratory Managers
- B-3: NHDES Limnology Center Intern Training Requirements
- B-4: VLAP Intern Field Sampling Procedures Training Assessment Evaluation Form
- B-5: VLAP Volunteer Monitor Annual Field Sampling Procedures Assessment Audit
- B-6: VLAP Annual Refresher Workshop Announcement (2002 Sampling Season)

Appendix C: Field Sampling Standard Operating Procedures

- C-1: VLAP Summer Sampling Scheduling (NHDES Limnology Center)
- C-2: VLAP Monitor's Field Manual
- C-3: YSI Dissolved Oxygen/Temperature Calibration and Computer Procedures
- C-4: Plankton Haul Sample Collection
- C-5: VLAP Field Data Sheet (Volunteer Monitors)
- C-6: VLAP Field Data Sheet (DES Biologist Annual Visit)
- C-7: VLAP Stream Survey Field Data Sheet
- C-8: VLAP Dissolved Oxygen/Temperature Profile Field Data Sheet
- C-9: NHDES Sampling Station Identification Form

Appendix D: Fixed Laboratory Standard Operating Procedures

- D-1: pH
- D-2: ANC
- D-3: Conductivity
- D-4: Turbidity
- D-5: Chlorophyll-a
- D-6: Total Phosphorus
- D-7: E.coli
- D-8: YSI Dissolved Oxygen Computer Procedures
- D-9: Microscopic Analysis (Plankton Analysis) and laboratory sheet
- D-10: Laboratory Equipment Maintenance and Cleaning
- D-11: Bench Book Data Sheets example with QA/QC checks
- D-12: VLAP Log-in System Sheet and Chain of Custody
- D-13: VLAP Log-In System Sample Labels
- D-14: VLAP Sample Receipt Checklist
- D-15: Duplicate Precision and CCV Limits SOP

Appendix E: Data Management, Analysis, and Reporting Standard Operating Procedures

- E-1: Monthly Data Report Preparation Methodology
- E-2: Laboratory Data Report Example
- E-3: Field QC Summary
- E-4: Chemical and Biological Parameter Explanations
- E-5: Converting D.O. Files to Import into FoxPro
- E-6: Entering/Editing Data into FoxPro
- E-7: Annual Report Preparation Methodology
- E-8: Creating Graphs Using Sigma Plot
- E-9: Regression Statistics for Trend Analysis Explanation

Appendix F: Sampling and Analysis Plans

- F-1: Sampling Analysis Plan Outline

A3 Distribution List and Project Personnel Sign-Off Sheet

A3.1 Distribution List

Table A3-1 illustrates the Distribution List for the NHDES VLAP QAPP.

Table A3-1: Distribution List

QAPP Recipients	Title	Organization	Telephone Number/email address
Andrea M. LaMoreaux	Volunteer Lake Assessment Program Coordinator	NHDES Biology Section	603-271-2658 alamoreaux@des.state.nh.us -or- vlap@des.state.nh.us
Jody Connor	Limnology Center Director, VLAP Program Manager	NHDES Biology Section	603-271-3414 jconnor@des.state.nh.us
Andrew Chapman	QA/QC Officer, Biology Section	NHDES Biology Section	603-271-5334 achapman@des.state.nh.us
Vince Perelli	NHDES QA Manager	NHDES Commissioner's Office Planning Unit	603-271-8989 vperelli@des.state.nh.us
Art Clark*	US EPA Quality Assurance Officer	US EPA-NE	617-918-8374 clark.arthur@epa.gov
Gerry Sotolongo*	USEPA QA Manager	US EPA-NE	617-918-8311 sotolongo.gerry@epa.gov
Rachel Rainey	Laboratory QA Officer	NHDES Laboratory Services	603-271-2993 rrainey@des.state.nh.us
Scott Ashley	NHDES Biology Section Database Coordinator	NHDES Biology Section	603-271-2968 sashley@des.state.nh.us
Bonnie Lewis	VLAP Satellite Laboratory Manager	Lake Sunapee Region Laboratory, Colby Sawyer College, New London, NH	603-526-3486 blewis@Colby-sawyer.edu
Fred Rogers	VLAP Satellite Laboratory Faculty Advisor	Franklin Pierce College Laboratory, Rindge, NH	603-899-4348 rogersfs@fpc.edu
Sue Rolke	VLAP Satellite Laboratory Manager	Franklin Pierce College Laboratory, Rindge, NH	603-899-1045, x 5108 susanrbr@hotmail.com
Volunteer Lake Assessment Program Participants	Volunteer Lake Monitors	Lake Associations throughout the State of New Hampshire	An electronic copy of the QAPP will be posted on the VLAP website (http://www.des.state.nh.us/wmb.vlap). Paper copies will be provided to volunteer monitors upon request.

* = Since NHDES VLAP receives state funding and does not receive EPA funding, EPA review is not required. However, the VLAP Coordinator and VLAP Project Manager are requesting that the EPA review this QAPP.

A3.2 Project Personnel Sign-off Sheet

The project personnel sign-off sheet is included in Table A3-2.

Table A3-2: Project Personnel Sign-Off Sheet (NHDES)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Andrea M. LaMoreaux	Volunteer Lake Assessment Program Coordinator	603-271-2248			
Jody Connor	Limnology Center Director, VLAP Project Manager	603-271-3414			
Scott Ashley	Biology Section Database Coordinator	603-271-2968			
Andrew Chapman	QA/QC Officer, Biology Section	603-271-5334			
Rachel Rainey	QA/QC DES Lab Services	603-271-2993			
Vince Perelli	NHDES QA Mgr.	603-271-8989			

Table A3-3: Project Personnel Sign-Off Sheet (VLAP Satellite Laboratories)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Bonnie Lewis	Lake Sunapee Region Lab	603-526-3486			
Fred Rogers	Franklin Pierce College Lab, Faculty Supervisor	603-899-4348			
Sue Rolke	Franklin Pierce College Lab, Lab Manager	603-899-4100 X5108			

A4 Project Organization

A4.1 Project Organization Description

The New Hampshire Department of Environmental Services Volunteer Lake Assessment Program requires the participation of a number of partners. The four major partners are the NHDES Biology Section, numerous volunteer monitors located throughout the state, and the VLAP satellite laboratories. Andrea LaMoreaux, NHDES Volunteer Lake Assessment Program Coordinator (who reports directly to Jody Connor, the Limnology Center Director and VLAP Program Manager), has the overall responsibility for training the volunteer monitors throughout the state in sample collection and watershed monitoring. NHDES and the volunteer monitors will collect samples from their lake/pond and its watershed, and will then bring samples to the NHDES Limnology Center Lab, the Lake Sunapee Region Laboratory at Colby Sawyer College in New London, or the Franklin Pierce College Laboratory in Rindge. NHDES, the Lake Sunapee Region Laboratory, and the Franklin Pierce College Laboratory will be responsible for sample analysis and data management. NHDES will be responsible for overall data management, report preparation, and making water quality observations and recommendations for sampling activities and watershed rehabilitation measures for each lake/pond that participates in VLAP. Andrea LaMoreaux, the VLAP Coordinator, is primarily responsible for the QAPP development and updates. Andrew Chapman is the QA Coordinator for the NHDES Limnology Lab and the satellite laboratories. Quality Assurance issues that arise will be discussed between Andrea LaMoreaux, Andrew Chapman, and Jody Connor, and communicated to the DES QA Manager and to the EPA through Andrew Chapman.

A4.2 Organization Chart

An organization chart that includes all parties involved, as well as their telephone numbers is included in Figure A4-1.

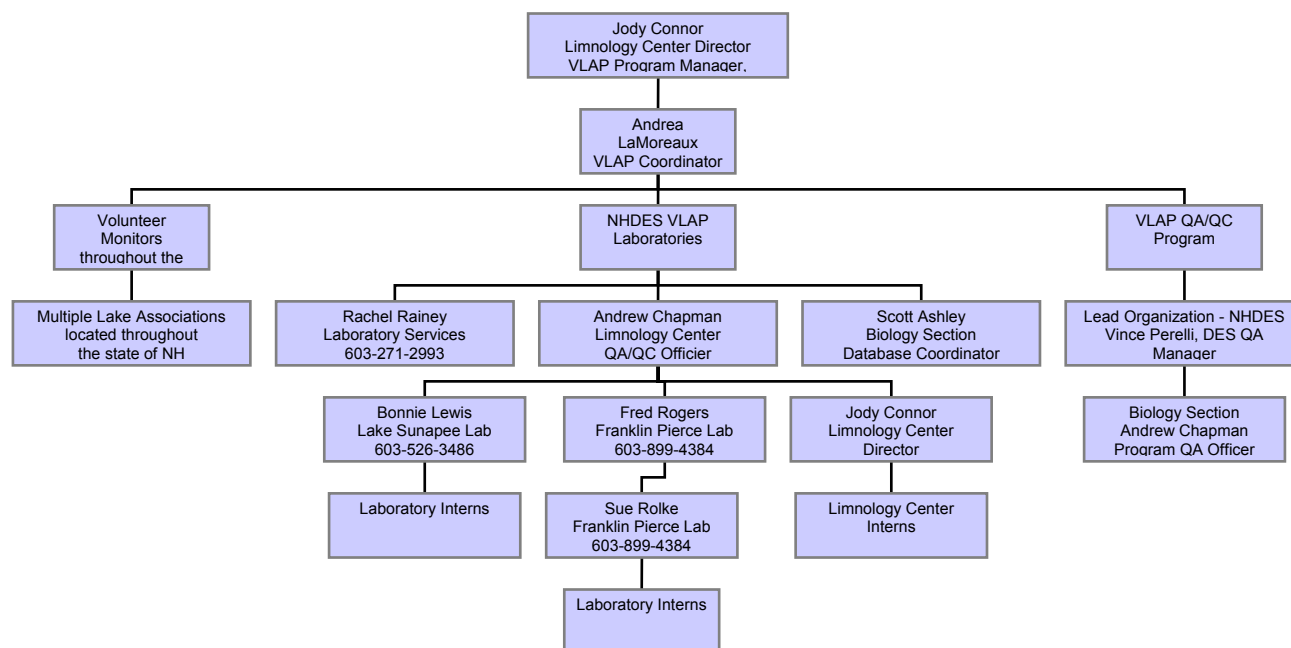


Figure A4-1: Organization Chart for the NHDES Volunteer Lake Assessment Program

A5 Problem (Program) Definition/Background

The New Hampshire Volunteer Lake Assessment Program (NH VLAP) was initiated in 1985 in response to an expressed desire of lake associations to be involved in lake protection and watershed management in the state. VLAP is a cooperative program between lake residents and the New Hampshire Department of Environmental Services (NHDES). Since 1985, the program has grown substantially as shown in Figure A5-1. In 2001, 141 lake associations and approximately 500 volunteers participated in NHDES VLAP, as listed in Appendix A-2.

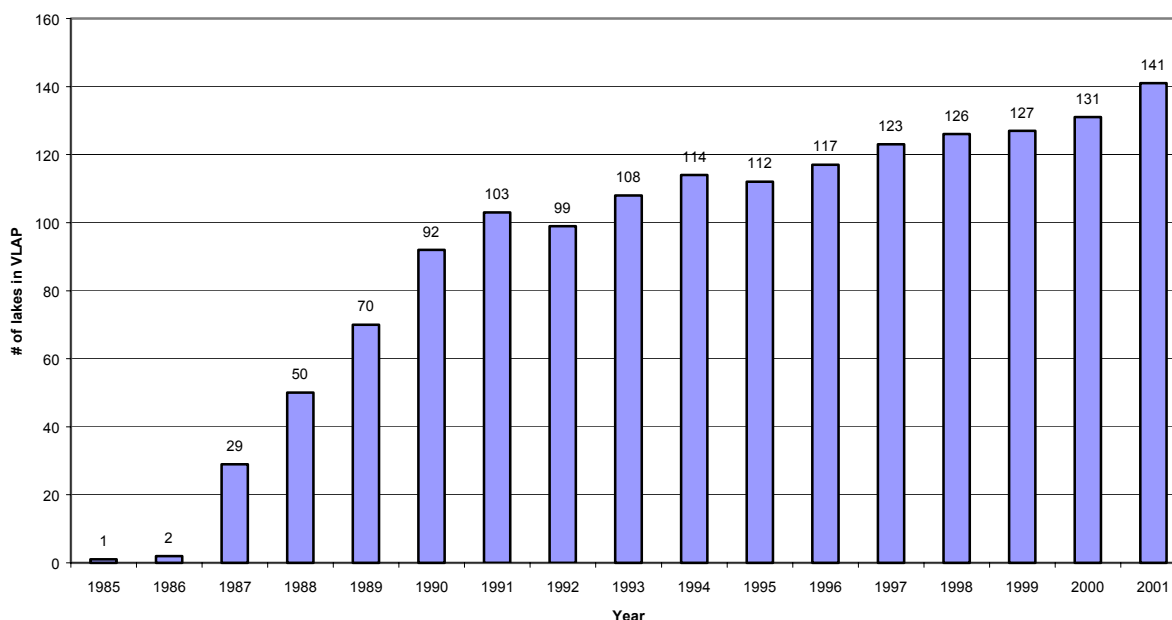


Figure A5-1: Volunteer Lake Assessment Program Participation 1985 - 2001

The following awards have been received by NH VLAP:

- New Hampshire Governor's Outstanding Volunteerism Award
- National Environmental Awards Council's Environmental Achievement Award
- New Hampshire Lakes Association Recognition Award for Contributions to Lake Protection & Education

A6 Project (Program) Task Description

A6.1 Project (Program) Purpose

The purpose of VLAP is to assess the chemical and biological characteristics of the lakes and ponds throughout the state to determine overall health of the system. Environmental results are measured by making comparisons to established means and ranges of water quality for the state of New Hampshire. Chemical, biological, and physical parameters are measured and compared to lakes throughout the state. This data is provided to NHDES and the volunteer monitors. The data is used by the NHDES for assessment, education, and reporting purposes. The data are used by the volunteer monitors for educational purposes and for guiding local lake management activities.

BENEFITS PROVIDED TO NHDES

VLAP is unique; in addition to studying the lake itself, volunteer monitors are trained to survey and monitor the surrounding watershed as well. Regular sample collection from the lake and the streams that enter it builds a strong set of baseline water quality data. By sampling the lake several times each year over a period of years, long-term water quality trends can be discerned. Such monitoring results in the early detection of water quality changes. This allows NHDES to trace potential problems to their source before a severe negative impact can take place on the lake. Over time, baseline data is used to determine long-term trends in lake water quality as well. Such data is an invaluable resource in maintaining federal lakes funding, and in NHDES' mission to assess and protect New Hampshire's lakes. If a negative water quality trend in a lake is revealed through VLAP monitoring, then the lake and its watershed may be eligible for more intensive study through the New Hampshire Clean Lakes Program.

The sampling efforts of the volunteer monitors supplement the environmental monitoring efforts of NHDES. Only through the help of volunteer monitors can such a volume of sampling be accomplished throughout the state.

BENEFITS PROVIDED TO VOLUNTEER MONITORS

VLAP allows lake associations the opportunity to play an active role in monitoring and protecting the beauty and value of the lake they live near. Specifically, volunteer monitoring leads to local education and awareness of land use and human practices that may be detrimental to lake quality and also empowers communities in their decision-making regarding lake management issues. Pollution prevention through routine monitoring ultimately saves the local community and the state the cost of expensive, after-the-fact remediation.

A6.2 Project (Program) Sampling Tasks

Table A6-1 summarizes the analytes to be sampled in VLAP. Table A6-2 summarizes field and quality control sampling.

Table A6-1: Contaminants of Concern and Other Target Analytes Table

Analyte	Project Action Limit* (Units) (wet or dry weight)	Project Quantitation Limit (Units) (wet or dry weight)	Achievable Laboratory Limits	
			MDLs	QLs
Total Phosphorus ^{3,4, &5}	N/A	0.005 mg/L	0.0008 mg/L ⁵	0.005 mg/L
			0.0013 ³	
			TBD ^{4,7}	
Conductivity ¹	N/A	TBD	TBD ²	TBD
			TBD ³	
			TBD ⁴	
Turbidity ¹	N/A	TBD	TBD ²	TBD
			TBD ³	
			TBD ⁴	
pH ¹	N/A	N/A	N/A	N/A
ANC (Alkalinity) ¹	N/A	N/A	N/A	N/A
Chlorophyll-a ¹	N/A	TBD	TBD	TBD
Phytoplankton ²	N/A	N/A	N/A	N/A
Dissolved Oxygen ⁶	N/A	0.5 mg/L & 5% Air Saturation	N/A	0.5 mg/L & 5% Air Saturation
E.coli ^{3,4, &5}	N/A	0 Counts	N/A	0 Counts

*Project Action Limits are not applicable in this study. This study is not the result of a regulatory issue, and the goal of the study is to test for current condition, not action limits.

¹ - NHDES Limnology Center, Lake Sunapee Region Laboratory at Colby Sawyer College and Franklin Pierce College Laboratory

² - NHDES Limnology Center

³ - Lake Sunapee Region Laboratory at Colby Sawyer College

⁴ - Franklin Pierce College Laboratory

⁵ - NHDES Laboratory Services

⁶ - YSI 52 Field DO Meter

⁷ - Insufficient data. MDL for the Franklin Pierce College laboratory will be calculated during the sampling season.

SAMPLING TASKS:

- Water chemistry samples will be collected by the volunteers and DES biologist once per season (June, July, or August) at each lake/pond. In addition, it is recommended that the volunteer monitors collect water quality samples at least two additional times during the sampling season without the DES biologist (independent of weather conditions). The parameters sampled for will include: turbidity, conductivity, pH, total phosphorus, and E.coli (optional) in each inlet. In-lake samples collected by the volunteer monitors when sampling without the DES biologist will include each of the previously listed parameters, as well as an analysis of chlorophyll-a, alkalinity, and Secchi Disk depth. When the DES biologist and volunteers sample together on the annual visit, temperature/oxygen and phytoplankton will also be tested.
 - Conductivity will be sampled to determine the amount of ions in the sample
 - pH will be sampled to determine the acidity/alkalinity of the water
 - Total phosphorus will be sampled to determine the concentration of this limiting nutrient at each sampling location
 - Chlorophyll-a will be measured to obtain an estimate of algal biomass
 - Secchi disk depth will be measured as an indication of water clarity
 - Oxygen concentrations will be measured to determine overall concentration and changes in those concentrations in the water column
 - Temperature will be measured along the water column to determine layering due to thermal stratification
 - Phytoplankton will be samples and analyzed to determine the biota composition of the lake
 - Acid neutralizing capacity will be measured to determine the buffering capacity of the lake.
 - E.coli may be measured to determine the amount of bacteria in the water that may indicate that diseases contained in human sewage or animal waste is present.

SYSTEM DESIGNS:

This project does not require remediation and/or monitoring engineered designs.

ANALYSIS TASKS:

The NHDES chemistry lab will analyze total phosphorus and E.coli as detailed in the SOPs included in Appendix D.

The NHDES Limnology Center Laboratory will analyze pH, Acid Neutralizing Capacity (ANC), turbidity, conductivity, chlorophyll-a, and phytoplankton as detailed in the SOPs included in Appendix D

The Satellite Laboratories will analyze pH, ANC, turbidity, conductivity, chlorophyll-a, total phosphorus, and E.coli as detailed in the SOPs included in Appendix D.

Table A6-3 summarizes information relevant to analytical services.

QUALITY CONTROL TASKS:

Quality control tasks for each parameter will be as detailed in Appendices C and D.

DATA MANAGEMENT TASKS:

Field data will be recorded on a field sheet and entered into a computer database upon return to the office. Laboratory data will be entered into a bench book and then entered into the Log-In system for analysis and tracking. Data printouts will be cross-referenced with bench book results for verification/validation purposes.

DOCUMENTATION AND RECORDS:

Field sampling sheets with checklists will be used throughout the study to ensure an all inclusive sample event. Hardcopy and computer records will be kept for each parameter.

DATA PACKAGES:

N/A

ASSESSMENT/AUDIT TASKS:

Assessments and audits are components of the NHDES Quality Assurance/Quality Control Plan.

Field Assessments/Audits:

On the annual DES visit to each lake/pond participating in VLAP, the volunteer monitors will be required to collect duplicate samples for data comparability purposes. Using the relative percent difference equation (RPD), the results for the duplicate samples and the original corresponding sample will be compared to determine if results for the original sample and the duplicates fall within 20% RPD. In addition, trip blanks will be brought out into the field and then returned to the lab for analysis to determine if any sample contamination occurs.

Once per week, the VLAP Coordinator and the VLAP intern will conduct a duplicate dissolved oxygen/temperature profile. The acceptance limit for the profile will be +/- 10% %Saturation and +/- 2 mg/L.

Table A6-2 lists where and how many duplicate samples are required to be collected through VLAP.

Laboratory Assessments/Audits:

Replicates are run for every ten samples in the VLAP Satellite and Limnology Center laboratories, and the data are presented in a QA/QC report at the end of each year. These replicates are analyzed to determine if they fall within the duplicate acceptance limit for that parameter. The replicate data will be analyzed on an annual basis to ensure that the analyses conducted by the laboratories can still meet the project quality objectives.

DATA VERIFICATION AND VALIDATION TASKS:

Data verification will include examining QA data by means of replicate checks, internal consistency checks of spiked samples and duplicate samples. Questionable data will be highlighted and examined to determine the origin of the deviation. The validation involves assessing the reasonableness of the data based on the measured and the expected values for that

parameter. Data will be compared with existing and historical data from individual sampling locations. These tasks are described in more detail in Section D of this document.

DATA USABILITY ASSESSMENT TASKS:

Data usability will be based on data verification and validation. Section D of this document discusses more data usability assessment tasks.

Table A6-2: Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Analytical Method/SOP Reference	Annual QC Sample Frequency per VLAP Lake/Pond	Appx % of Field Duplicate per year	Appx % of Blanks per year
Surface Water (SW)	Total Phosphorus	EPA 365.2/ D-6	Inlets: 1 Deep spot: 1 per in-lake statio	15%	15%
SW	Conductivity	2510B Standard Methods 20 th Ed. 1998/ D-3	Inlets: 1 Deep spot: 1 per in-lake station	15%	15%
SW	Turbidity	2130B Standard Methods 20 th Ed. 1998 D-4	Inlets: 1 Deep spot: 1 per in-lake station	15%	15%
SW	pH	2310B Standard Methods 20 th Ed. 1998 D-1	Inlets: 1 Deep spot: 1 per in-lake station	15%	N/A
SW	Alkalinity (ANC)	2320B Standard Methods 20 th Ed. 1998/ D-2	N/A	N/A	N/A
SW	Chlorophyll-a	EPA 446.0 10200H Standard Methods 20 th Ed. 1998 D-5	Deep spot: 1 composite or integrated sample per in-lake station	15%	15%
SW	E.coli	9222B Standard Methods 20 th Ed. 1998 Hach Method 10029 40 CFR 141 D-7	1 if volunteers collect <i>E. coli</i> samples	15%	15%
SW	Phytoplankton	10200 E-F Standard Methods 20 th Ed. 1998/ D-9	N/A	N/A	N/A
SW	Dissolved Oxygen	YSI Model	1 per week by VLAP Coordinator & VLAP Intern	25%	N/A

Table A6-3: Analytical Services Table

Medium & Matrix	Analytical Parameter	Analytical Method/SOP	Data Package Turnaround Time	Lab/Organization
SW	Total Phosphorus	EPA 365.2/ D-6	30 days	NHDES Laboratory Services 6 Hazen Drive Concord, NH 03301 Rachel Rainey Satellite Laboratories
SW	E.coli	9222B Standard Methods 20 th Ed. 1998 Hach Method 10029 40 CFR 141 ¹ / D-7	24 hours	NHDES Laboratory Services 6 Hazen Drive Concord, NH 03301 Rachel Rainey Satellite Laboratories
SW	Conductivity	2510B Standard Methods 20 th Ed. 1998/ D-3	24 hours	NHDES Limnology Center 6 Hazen Drive Concord, NH 03301 Andrew Chapman Satellite Laboratories
SW	Turbidity	2130B Standard Methods 20 th Ed. 1998/ D-4	24 hours	NHDES Limnology Center 6 Hazen Drive Concord, NH 03301 Andrew Chapman Satellite Laboratories
SW	pH	2310B Standard Methods 20 th Ed. 1998/ D-1	24 hours	NHDES Limnology Center 6 Hazen Drive Concord, NH 03301 Andrew Chapman Satellite Laboratories

Medium & Matrix	Analytical Parameter	Analytical Method/SOP	Data Package Turnaround Time	Lab/Organization
SW	Alkalinity (ANC)	2320B Standard Methods 20 th Ed. 1998/ D-2	24 hours	NHDES Limnology Center 6 Hazen Drive Concord, NH 03301 Andrew Chapman Satellite Laboratories
SW	Chlorophyll-a	EPA 446.0 10200H Standard Methods 20 th Ed. 1998/ D-5	7 days	NHDES Limnology Center 6 Hazen Drive Concord, NH 03301 Andrew Chapman Satellite Laboratories
SW	Plankton	10200 E-F Standard Methods 20 th Ed. 1998/ D-9	30 days	NHDES Limnology Center 6 Hazen Drive Concord, NH 03301 Andrew Chapman Satellite Laboratories

¹ Lake Sunapee Region Satellite Laboratory and Franklin Pierce College Laboratory

A6.3 Project (Program) Schedule Timeline

Following are summary tables that outline the tasks that NHDES, the satellite laboratories, and the volunteer monitors will conduct through VLAP, which includes an anticipated timeline, (on an annual basis) for completion.

Table A6-4: Project Schedule Timeline (NHDES)

Task	Time (on an annual basis)
Initial QAPP preparation	January – May 2002
QAPP updates	On an ongoing basis during the year
Provide training at an Annual Training VLAP Refresher Workshop prior to sampling season	May
Train interns that will be working in the NHDES Limnology Center and the Satellite Laboratories in proper sample collection and analysis techniques	May, and on-going during the sampling season
Train volunteers in proper sampling techniques during an annual visit to the lake/pond	Once during sampling season (June - August*)
Provide sampling equipment, upon advanced request, to volunteers	Sampling season (June - August*)
Analyze samples in the laboratory	Sampling season (June - August*)
Send out monthly data reports to volunteers	Sampling season (June - August*)
Interpret water quality data collected during the sampling season and compile Annual Report for each lake/pond participating in program	Data interpretation (October – March) Annual Report to be sent out by the end of April following the year
Meet with satellite Laboratories at the end of the season to discuss the successes/problems that occurred during the sampling season	Winter
Provide an annual program newsletter, <i>The Sampler</i>	April – May
Meet with lake associations, upon request, to address concerns	As requested by the volunteers at any time during the year
Investigate water quality complaints	As requested by the volunteers at any time during the year
Provide technical/educational materials	As requested by the volunteers at any time during the year
Annual Self Assessment – VLAP QA/QC Report for Limnology Center Annual QA/QC Report	January

* = Some volunteer monitors choose to extend the sampling season to May - September

Table A6-5: Project Schedule Timeline (VLAP Satellite Laboratories)

Task	Time (on an annual basis)
Train interns in proper sample collection and analysis techniques	May, and on-going during the sampling season
Provide sampling equipment, upon advanced request, to volunteers	Sampling season (June - August*)
Analyze samples in the laboratory	Sampling (June - August*)
Send out monthly data reports to volunteers during the sampling season	Sampling season (June - August*)
Send a copy of monthly data reports sent to the volunteers to NHDES	Weekly during the sampling season (June - August*)
Send an electronic copy of the data entered into the Sample Log-in system to NHDES	Monthly during the sampling season (June - August*)
Meet with NHDES at the end of the season to discuss the successes/problems that occurred during the sampling season	Winter

* = Some volunteer monitors choose to extend the sampling season to May - September

Table A6-6: Project Schedule Timeline (Volunteer Monitors)

Task	Time (on an annual basis)
Attend the Annual Training Refresher Workshop prior to sampling season	May
Contact DES to schedule annual lake visit with biologist	Spring
Schedule equipment and bottle pick-up in advance for sample events conducted without DES Biologist	Sampling season (June - August*)
Sample with the DES Biologist on an annual lake visit	Sampling season (June - August*)
Collect water samples during the summer	Sampling season (June - August*) (Note: Volunteers are encouraged to collect samples at least once per month from June to July, but some associations choose to sample more or less frequently than this)
Deliver collected water samples to the DES Limnology Center (or appropriate satellite laboratory) within 24 hours of sample collection	Sampling season (June - August*)
Provide minimal financial support for sample analysis	Sampling season (June - August*)
Report on potential water quality violations to DES when necessary	As needed during the year
Pass on water quality information including annual report and annual newsletter to associations, community, and town officials	On-going during the year

* = Some volunteer monitors choose to extend the sampling season to May - September

A7 Quality Objectives and Criteria

A7.1 Program Quality Objectives

WHO WILL USE THE VLAP DATA?

VLAP:

Education
Assessment
Recommendations

NHDES:

Clean Lakes Program
Assessment Reporting

Volunteer Monitors:

Reporting
Education

HOW WILL THE DATA GENERATED BY NHDES VLAP BE USED?

VLAP:

The VLAP Program will use the water quality data collected during each sampling season for incorporation into an annual report for each lake/pond that participated in the program that season. The main objectives of the annual report are as follows:

1. Educate volunteer monitors about lake ecology, and about how human activities can affect the water quality of lakes and ponds throughout the state.
2. Educate volunteers about the quality of their lake/pond. Water quality data collected each sampling season will be measured and compared to established means and ranges of water quality for the state of New Hampshire for assessment purposes. In addition, the data collected each season will be compared to the historical data for that lake/pond (all the data gathered at the lake/pond since they joined VLAP) to determine if any changes in water quality have occurred since the lake/pond joined the program.
3. Provide recommendations, when necessary, regarding additional sampling activities that volunteers should implement in order to provide a better understanding and assessment of the water quality of the lake/pond.

NHDES:

1. NH Clean Lakes Program:

The NHDES will use the data gathered through VLAP as a screening mechanism to identify lakes/ponds that have experienced decreases in water quality. These lakes/ponds may be eligible for more intensive study through the New Hampshire Clean Lakes Program.

2. NHDES Assessment Reporting:

The NHDES will use the data gathered through VLAP to supplement the data needs of the water quality assessment listing process that is implemented by NHDES to assess the waters of the State of New Hampshire, as required by EPA and Congress.

Volunteer Monitors:

Volunteer monitors will use the data and recommendations provided by VLAP in the annual report to educate themselves, their respective lake associations, watershed residents, communities, and town officials about the water quality of the lake/pond. Lake Associations will provide recommendations to town officials regarding town planning and lake management issues.

Other Parties:

The data will also be available to other interested parties, such as the EPA or the University of New Hampshire, for regional reporting purposes.

WHAT TYPES OF DATA ARE NEEDED?

Quantitative and qualitative data for the following parameters will be needed to determine overall water quality conditions for each lake/pond that participates in the program;

Total phosphorus
Conductivity
Turbidity
pH
Chlorophyll-a
Alkalinity (Acid Neutralizing Capacity)
Plankton
Clarity (Secchi-disk transparency)
Dissolved Oxygen
E.coli (this parameter is optional and will be sampled for as requested by the volunteer monitors)
Temperature (to compute the amount of dissolved oxygen)

Project action limits for these parameters need not be established because this is not a regulatory issue. The goal of this program is to test for current conditions in the lake and watershed. Analytical parameters and field and laboratory techniques are detailed in the standard operating procedures (SOPs) in Appendix C and D.

HOW 'GOOD' DO THE DATA NEED TO BE?

Data need to be collected on a consistent basis, with approximately 15-25% replication and 15% blanks analyzed with the samples. Data need to be representative of the conditions throughout the lake and watershed. Precision, accuracy/bias, and quantitation limits are included in the SOPs in Appendix D.

HOW MUCH DATA ARE NEEDED?

Since the nature of this program is voluntary, NHDES does not require that the volunteer monitors conduct a specific number of sampling events per season. However, volunteers are encouraged to sample at least once each month over the course of the sampling season (June – August). Some volunteer monitors choose to sample once per month from May – September.

WHEN, WHERE, AND HOW SHOULD DATA BE GENERATED/COLLECTED?

Samples are collected from each layer at the lake deep spot, at the major inlets to the lake/pond, and the outlet. In addition, samples are typically collected along tributaries located throughout the watershed where there is a suspected source of pollution (such as a failing septic system, construction site, roadway crossing, etc.). Data will be collected according to the field sampling protocols outlined in “The Monitor’s Field Manual” which is included in Appendix C-2.

WHO WILL COLLECT AND GENERATE THE DATA?

The volunteer monitors are required to schedule an annual lake visit with the DES Biologist (the VLAP Coordinator or the VLAP Intern) once each sampling season. This annual visit with the biologist provides an opportunity for the biologist to assess and document the volunteer monitors’ ability to follow the standard operating procedures for field sample collection (refer to the annual “Sampling Procedures Assessment Audit” provided in Appendix B-5) and provides an annual refresher training for the volunteers. During the annual visit, the volunteer monitors will collect duplicate samples. Trained volunteers that decide to sample in addition to the annual biologist visit, will sample on their own. DES-trained seasonal interns may also collect and will generate the data in the Limnology Center Laboratory.

HOW WILL THE DATA BE REPORTED?

Data will be analyzed, and means and ranges will be calculated for each parameter. Data summary statistics will be used to determine means, ranges, medians and standard deviations to identify outliers and measurement errors. These data will be compared with historical water quality data and with established means and ranges of water quality for the state of New Hampshire to determine changes and the relative health of the lake and watershed.

The data for lakes/pond that have participated in VLAP for at least ten years will be analyzed using simple linear regression statistics. Specifically, a Student t-test, using the 95% confidence interval, will be used to determine if the annual mean for in-lake chlorophyll-a, transparency, and total phosphorus has changed (either increased or decreased) since monitoring began. If a significant change in the annual mean for mean for in-lake chlorophyll-a, transparency, and total phosphorus is shown, then the strength of the trend will be reported (Refer to Appendix E-9).

The results will be reported to lake monitoring group in a “Bi-Annual Report” or “Interim Report” for each lake. Specifically, on an alternating basis after each sampling season, each lake will receive a “Bi-Annual Report” or an “Interim Report (Note: After each sampling season, approximately 50 of the lakes/ponds will receive a “Bi-Annual Report” and approximately 50% of the lakes/ponds will receive a “Interim Report”). The contents of the “Bi-Annual Report” and the “Interim Report” are as follows:

Bi-Annual Report

- Introduction
- Observations & Recommendations (full version)
- List of Useful Resources
- Annual Sampling Assessment Audit Summary
- QC Data Summary
- Regression Statistical Analysis*
- Deep Spot Graphs (Chl-a, Secchi-Disk, TP)
- Data Tables (all sampling parameters for all sites)
- Lake Map (showing sampling locations)
- Special Lake Ecology Related Topic
- Statistical Analysis Raw Data

Interim Report

- Introduction
- Observations & Recommendations (abbreviated)
- List of Useful Resources
- Annual Sampling Assessment Audit Summary
- QC Data Summary
- No Regression Statistical Analysis
- Deep Spot Graphs (Chl-a, Secchi-Disk, TP)
- Data Tables (all sampling parameters for all sites)
- Lake Map (showing sampling stations)
- Special Lake ecology Related Topic
- No Statistical Analysis Raw Data

* = Regression analysis will be conducted for all lakes/ponds that have at least 10 years of data

A7.2 Measurement Performance Criteria

Table A7-1 summarizes the performance criteria for each parameter.

PRECISION

Analyzing sample replicates and determining if those replicates fall within the acceptance range for that testing protocol will measure precision. If the replicate falls within the acceptance range, the precision will be acceptable. If the replicate falls outside of the acceptance range, the sample will be run again to determine if there was an analyst error or an equipment error that led to the imprecision. Further detail can be found in the Duplicate Precision SOP in Appendix D-15.

Field Duplicate precision for water quality samples will be analyzed using the relative percent difference (RPD) equation:

$$\text{Relative Percent Difference} = \frac{|x_1 - x_2|}{\frac{x_1 + x_2}{2}} \times 100 \%$$

where x_1 is the original sample concentration
 x_2 is the replicate sample concentration

RPDs < 20% will be deemed acceptable.

The acceptance limit for the dissolved oxygen profile field duplicate precision will be +/- 10% % Saturation and +/- 2 mg/L.

ACCURACY/BIAS

Accuracy/Bias will be determined through the completion of trip blanks and continuing calibration verification (CCV) checks for sample accuracy within method ranges. CCV's limits and procedures are detailed in Appendix D-15. Trip blanks will need to be less than the project quantification limit. Accuracy for total phosphorus analysis is determined through the analysis of spiked samples (Refer to Total Phosphorus SOPs in Appendix D-6).

REPRESENTATIVENESS

Inlet sample locations are located near the mouth of the stream just before it enters into the lake/pond (and where it will not be affected by backflow from the lake/pond) which provides a representation of the overall condition of the stream and the quality of the water entering the lake/pond. When the data show that a particular parameter is elevated in an inlet, then the VLAP coordinator would recommend (either during the sampling season, or in the annual report) additional sampling locations be established along the stream. These sample locations are chosen to show the representative conditions of the stream, which helps to identify potential areas of pollution or contamination throughout the watershed.

The deep spot of the lake/pond is selected as a sampling site so as to be representative of all depth conditions present in the lake. The deep spot is found using triangulation from fixed shoreline points, and the location is confirmed by conducting a simple depth measurement (lowering a Kemmerer bottle filled with water on a calibrated chain to check the depth). Some volunteer monitors also use fish finders and GPS units, in addition to the previously listed methods, to locate the deep spot. On the annual biologist visit, a dissolved oxygen/temperature profile is conducted at the deep spot to determine the distribution of thermal layers in the water column. Samples are collected at approximately the mid-point of each thermal layer.

A sample location is chosen at the outlet of the lake/pond to provide a representative idea of the quality of the water that is leaving the lake/pond.

COMPARABILITY

Comparability between samples will be achieved through maintaining consistency with SOPs, sampling locations, and sampling methods. Samples will be collected in the same locations, at approximately the same time of day (typically between 10am and 2pm), and will have the same holding times. Since the sample locations each season will coincide with the stations sampled in the previous season, data comparisons will be made between the data collected each season.

SENSITIVITY (MEASUREMENT RANGE)

Background information on the majority of the inlets and deep spots for the lakes and ponds in the state has been generated since 1975 through the NHDES Lake Survey Program, and the data show that the methods and instruments are able to detect the analyte of concern and other target compounds at the level of interest. Detectable ranges of the methods and the equipment (as shown in methods and SOPs) are adequate for the purposes of this study design.

COMPLETENESS

Since VLAP only recommends, and does not require that groups collect samples three times a year, adequate completeness will be set at 75% of participating lakes collecting more than twice per year.

Table A7-1: Measurement Performance Criteria Table for Surface Water Samples

Matrix	Analytical Parameter	Analytical Method/ SOP Reference	Measurement Performance Criteria			QC Sample and/or Activity Used to Assess Measurement Performance
			Precision	Accuracy	Sensitivity	
Water	Conductivity ^{1,2, &3}	D-3	RPD<20%			Field Duplicate
				<PQL		Trip Blank
				+/- 10% @ 100 umhos		CCV
					<= 1/3 PQL	Annual MDL Calculation
			+/- 10%			Lab Duplicate
Water	Turbidity ^{1,2, &3}	D-4	RPD<20%			Field Duplicate
				<PQL		Trip Blank
				+/- 10% @ 10 NTU ¹ 1 NTU ² 3 NTU ³		CCV
					<= 1/3 PQL	Annual MDL Calculation
			0-20 NTU +/- 1 >20-100NTU +/- 3 >100 NTU +/- 10			Lab Duplicate
Water	pH ^{1,2, &3}	D-1	RPD<20%			Field Duplicate
				+/- .1 @ 6 pH		CCV
			+/- .5 pH Units			Lab Duplicate
Water	Alkalinity(ANC) ^{1,2, &3}	D-2	+/- 1.20			Lab Duplicate
Water	Chlorophyll-a ^{1,2, &3}	D-5	RPD<20%			Field Duplicate
				<PQL PQL TBD		Trip Blank
				N/A-Back Correction only		Instrument Blank
			+/- 3 ug/L			Lab Duplicate
				<MDL MDL TBD		Method Blank
Water	Total Phosphorus ^{2,3, &4}	D-6	RPD<20%			Field Duplicate
			+/-0.004			Lab Duplicate
				<PQL		Trip Blank
				<MDL		Reagent Blank
					<= 1/3 PQL	Annual MDL Calculation
				82-114%		Laboratory Matrix Spike
				+/-10% of 0.050		LFB ⁴
				+/-10% of 0.100		ICV ⁴
				+/-20% of 0.005		LCS ⁴
				r ² > .995		Initial Calibration ^{2&3}
				+/-20% of 0.005, +/-10% of 0.025, 0.050, 0.100, and 0.200		Calibration Verification Check ^{2&3}
				+/-10% of 0.050		Continuing Calibration Verification ^{2&3}
Water	E.coli ^{2, 3, &4}	D-7	RPD<20%			Field Duplicate
				0 Counts		Trip Blank
				0 Counts		Blank
			+/-5% or 10%			Duplicate Counts

1 NHDES Limnology Center

2 Franklin Pierce College laboratory

3 Lake Sunapee Region Laboratory at Colby Sawyer College

4 NHDES Laboratory Services

A8 Special Training/Certification

A8.1 Personnel Responsibilities and Qualifications

Table A8-1 details personnel responsibilities and qualifications.

Table A8-1: Personnel Responsibilities and Qualifications

Name	Organization	Responsibilities	Education and Experience
Andrea LaMoreaux	NHDES Biology Section	VLAP Coordinator	Refer to Appendix B-1*
Jody Connor	NHDES Biology Section	Limnology center Director, VLAP Program Manager (Oversees program progress)	Refer to Appendix B-1*
Andrew Chapman	NHDES Biology Section	QA/QC Limnology Center	Refer to Appendix B-1*
Scott Ashley	NHDES Biology Section	Limnology Center Database Coordinator	Refer to Appendix B-1*
Vince Perelli	NHDES	NH DES QA Manager / QAPP Reviewer	Refer to Appendix B-1*
Rachel Rainey	NHDES Laboratory Services	Sample analysis and lab QA	Refer to Appendix B-1*
Bonnie Lewis	Sunapee Region Laboratory	VLAP Satellite Laboratory Manager	Refer to Appendix B-2
Fred Rogers	Franklin Pierce College Lab, Faculty Supervisor	VLAP Satellite Laboratory Faculty Advisor	Refer to Appendix B-2
Sue Roulke	Franklin Pierce College Lab, Lab Manager	VLAP Satellite Laboratory Manager	Need to obtain

*Resumes are not included. NHDES Supplemental Job Descriptions (SJD) and Position Responsibilities are submitted in lieu of resumes.

A8.2 Special Training Requirements/Certification

Any special training requirements or certifications for the above listed parties are detailed in the NHDES SJD or the resume for each person, which are included in Appendix B-1. Tables A8-2 and A8-3 summarize the laboratory intern training requirements and certification, and Table A8-4 summarizes volunteer training requirements and certification.

Table A8-2: Special Training Requirements for NHDES Laboratory Interns

Project function	Description of Training	Training Provided by	Training Provided to	Location of Training Records
Water Sample Collection	In-lake and tributary water sample and data collection procedures, provided in the field	NHDES VLAP Coordinator, Andrea LaMoreaux	NHDES VLAP Intern	NHDES Limnology Center Refer to Appendix B-4 for VLAP Intern Field Sampling Procedures Training and Assessment Form Refer to Appendix C for Field Sampling SOPs
Water Sample Analysis	Analysis of water samples in the laboratory	NHDES Biology section QA/QC Coordinator, Andrew Chapman	NHDES Limnology Center Interns Satellite Laboratory Managers	NHDES Limnology Center Refer to Appendix B-3 for Intern Training Form Refer to Appendix D for Laboratory Analysis SOPs
Data Management	Logging in samples into database and entering sample results into database	NHDES Biology section QA/QC Coordinator, Andrew Chapman	NHDES Limnology Center Interns Satellite Laboratory Managers	NHDES Limnology Center Refer to Appendix B-3 for Intern Training Form Refer to Appendix D-9 for Data Management SOPs
Data Analysis	Analyzing and interpreting data and compiling annual reports	NHDES VLAP Coordinator, Andrea LaMoreaux	NHDES VLAP Intern	NHDES Limnology Center Refer to Appendix D-9 for Data Analysis SOPs

Table A8-3: Special Training Requirements for Satellite Laboratory Interns

Project function	Description of Training	Training Provided by	Training Provided to	Location of Training Records
Water Sample Analysis	Analysis of water samples in the laboratory	Satellite Laboratory Managers	Satellite Laboratory Interns	Satellite Laboratory NHDES Limnology Center Refer to Appendix B-3 for Intern Training Form
Data Management	Logging in samples into database and entering sample results into database and transferring data to NHDES	Satellite Laboratory Managers	Satellite Laboratory Interns	Satellite Laboratory NHDES Limnology Center Refer to Appendix B-3 for Intern Training Form Refer to Appendix E-9 for Data Management SOPs

Table A8-4: Special Training Requirements for Volunteer Monitors

Project function	Description of Training	Training Provided by	Training Provided to	Location of Training Records
Water Sampling	Water sample collection procedures (VLAP Annual Refresher Workshop)	NHDES VLAP Coordinator Andrea LaMoreaux	Volunteer Monitors	NHDES Limnology Center Refer to Appendix B-6 for sample announcement for VLAP Annual Refresher Workshop Refer to Appendix C-5 and C-6 for the VLAP Field Data sheets which document volunteer training status
Water Sampling	Water sample collection procedures in the field during an annual biologist visit to each lake/pond in VLAP	NHDES VLAP Coordinator Andrea LaMoreaux or VLAP Intern	Volunteer Monitors	NHDES Limnology Center Refer to Appendix B-5 for the VLAP Volunteer Monitor Annual Field Sampling Procedures Assessment Audit Form Refer to Appendix C-5 and C-6 for the VLAP Field Data sheets which document volunteer training status
Water Sampling	When samples are dropped off at the laboratory by volunteers, a sample receipt checklist is used to “assess” and “re-train” volunteers (if necessary) in proper field sampling collecting procedures	Laboratory Managers and Interns NHDES VLAP Coordinator Andrea LaMoreaux or VLAP Intern	Volunteer Monitors	Satellite Laboratory NHDES Limnology Center Refer to Appendix D-14 for the VLAP Sample Receipt Checklist

It is important to note that samples will not be accepted from any volunteers from a new lake or pond that did not participate in VLAP during the previous sampling season, without first being trained by the DES biologist.

A9 Documents and Records

A9.1 Communication Pathways

As coordinator of program, Andrea LaMoreaux, the VLAP Coordinator, will be the primary contact for all parties involved in the NHDES Volunteer Lake Assessment Program. If problems arise in the field, laboratory, or in any phase of the program, the VLAP Coordinator will be contacted and will determine the best course of action based upon the circumstances and the outcome of consultations with Jody Connor (Limnology Center Director and VLAP Project Manager) and Andrew Chapman (Limnology Center QA Officer).

A9.2 Modifications to Approved QAPP

If changes or modifications to the QAPP are required, the VLAP Coordinator will be responsible for drafting and submitting changes to US EPA-NE after communicating these changes to Andrew Chapman, Jody Connor, and Vince Perelli.

A document control format has been applied to the header of each page of the document as follows:

NHDES Volunteer Lake Assessment Program Generic QAPP Revision Number: Revision Date: Page ____ of ____

Once the changes have been approved by the US EPA-NE, a hard copy of the updated of the VLAP Generic QAPP will be provided to the following project personnel for review as outlined in Table A9-1 and A9-2.

Table A9-1: Updated QAPP Project and Sampling Analysis Plan Personnel Sign-Off Sheet (NHDES)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Andrea M. LaMoreaux	Volunteer Lake Assessment Program Coordinator	603-271-2248			
Jody Connor	Limnology Center Director, VLAP Program Manager	603-271-3414			
Scott Ashley	Biology Section Database Coordinator	603-271-2968			
Andrew Chapman	QA/QC Officer, Biology Section	603-271-5334			
Rachel Rainey	QA/QC DES Lab Services	603-271-2993			
Vince Perelli	NHDES QA Mgr.	603-271-8989			

Table A9-2: Updated QAPP Project and Sampling Analysis Plan Personnel Sign-Off Sheet (Satellite Laboratories)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Bonnie Lewis	Lake Sunapee Region Lab	603-526-3486			
Fred Rogers	Franklin Pierce College Lab, Faculty Supervisor	603-899-4348			
Susan Rolke	Franklin Pierce College Lab, Lab Manager	Lab: 603-899-4384 Office: 603-899-4100, ext. 5108			

The updated version of the QAPP will replace the outdated version on the NHDES VLAP website (<http://www.des.state.nh.us/wmb/vlap>) and the volunteer monitors will be notified, by email or by letter, that the QAPP has been updated. A hard copy of the updated QAPP will be provided to the volunteer monitors upon request.

A9.3 Sampling and Analysis Plans

If sampling at a particular lake/pond will deviate from the procedures and methods described in the Generic VLAP QAPP, sampling and analysis plans (SAPs) will be prepared by the VLAP Coordinator prior to field work. A copy of the SAP will be retained in the VLAP Program files. A copy of the approved plan will be send to the DES Quality Assurance Manager. The VLAP Coordinator is responsible for communicating the SAP and other QA/QC requirements to the VLAP Coordinator and volunteer monitors that may be working on the project (Refer to Appendix F-1).

A9.4 Project Documentation and Records

Table A9-3 discusses the documentation and records that will be generated through VLAP.

Table A9-3: Project Documentation and Records Table

Laboratory and Field Sampling SOP Training Records	Sample Collection Records	Field Analysis Records	Fixed Laboratory Records	Project Data Assessment Records
VLAP Annual Workshop Attendance List	Field Data Sheets (Refer to Appendix C-5, C-6, C-7, C-8)	Raw field data	Bench book records	NHDES Limnology Center QA/QC Report
VLAP Volunteer Monitor Annual Field Sampling Procedures Assessment Audit Form (Refer to Appendix B-5)	VLAP Sample receipt Checklist (Refer to Appendix D-14)		Computer databases	
NHDES Limnology Center Intern Training Requirements (Refer to Appendix B-3)	VLAP Volunteer Monitor Annual Field Sampling Procedures Assessment Audit Form (Refer to Appendix B-5)		Billing receipts for sample analysis	
NHDES VLAP Intern Field Sampling Procedures Training Assessment Form (Refer to Appendix B-5)	Station Identification Forms (Refer to Appendix C-9)		Certificates of Tolerance Conformance for Instrument/Equipment Testing, Inspection, and Maintenance	

A9.5 Field Analysis Data Package Deliverables

When volunteers sample the lakes and inlets, completed data forms and samples must be returned to the laboratory within 24 hours. All information collected in the field by volunteers will be kept by NHDES.

All raw data will be kept by NHDES for at least five years.

A9.6 Fixed Laboratory Data Package Deliverables

Data from parameters analyzed in the NHDES Limnology Center and the satellite laboratories will be entered immediately upon analysis into meter-respective bench books. These data will then be entered weekly into the sample Log-In system and cross-referenced with bench book data upon printout.

Data analyzed in the NHDES Laboratory Services Unit will be electronically entered into the Limnology Center database upon completion of the analyses. Turnaround times for all samples are 30 days. Laboratory login sheets and custody sheets are returned to the VLAP coordinator.

A9.7 Data Reporting Formats

FIELD RECORDINGS

Field recordings will be made in ink. The data being collected in the field will be collected following the procedures outlined in the NH Department of Environmental Services' Quality Management Plan guidance as outlined in Section 8. Field data sheets shown in Appendix C-5, C-6, C-7, C-8, and C-9 will be used to record field data.

MONTHLY DATA REPORTS

At the end of each month during the sampling season, data will be sent to the volunteer monitors for each sampling event they conducted during that month (typically 1 sample event) (Refer to Appendix E-2). A copy of the original data sheet that was submitted with the samples, and a chemical and biological parameter explanation detailing each parameter will be sent to the volunteer monitors (Refer to Appendix E-4). In addition, a summary of the results and relative percent difference (RPD) calculations of the QC samples (field duplicates and trip blanks) will be included in the monthly report when the annual biologist visit was conducted (Refer to Appendix E-3).

ANNUAL VLAP REPORTS

After each season, the VLAP Coordinator and VLAP Intern will analyze and interpret the data, and will generate an individual "Bi-Annual Report" or "Interim Report" for each lake/pond that participated in VLAP. The contents of the "Bi-Annual Report" and the "Interim Report" are as follows:

Bi-Annual Report

- Introduction
- Observations & Recommendations (full version)
- List of Useful Resources
- Annual Sampling Assessment Audit Summary
- QC Data Summary
- Regression Statistical Analysis*
- Deep Spot Graphs (Chl-a, Secchi-Disk, TP)
- Data Tables (all sampling parameters for all sites)
- Lake Map (showing sampling locations)
- Special Lake Ecology Related Topic
- Statistical Analysis Raw Data

Interim Report

- Introduction
- Observations & Recommendations (abbreviated)
- List of Useful Resources
- Annual Sampling Assessment Audit Summary
- QC Data Summary
- No Regression Statistical Analysis
- Deep Spot Graphs (Chl-a, Secchi-Disk, TP)
- Data Tables (all sampling parameters for all sites)
- Lake Map (showing sampling stations)
- Special Lake ecology Related Topic
- No Statistical Analysis Raw Data

* = Regression analysis will be conducted for all lakes/ponds that have at least 10 years of data

Specifically, for QA purposes, the “Bi-Annual Report” and the “Interim Report” will include the following: a summary of any problems that were observed regarding sample collection procedures and any corrective actions implemented (these will be noted on the VLAP sample receipt checklist for each set of samples dropped off at the lab); a summary of the volunteer monitor performance on the annual field sampling procedures assessment and any corrective actions implemented (this will be conducted on the annual visit by the DES biologist); and, a summary of the how the results of the duplicate samples and trip blanks met project performance goals.

“Bi-Annual Reports” and “Interim Reports” will be filed electronically and in paper files indefinitely at NHDES. A copy of the annual report will be sent to each monitoring group. In addition, the most recent “Bi-Annual Reports” and “Interim Reports” for each lake/pond will be posted on the VLAP website, provided that there is adequate intern support to accomplish this task each season.

ANNUAL QA/QC REPORTS

The Annual NHDES Limnology Center QA/QA Report, written by the NHDES QA/QC Coordinator, Andrew Chapman, will document the number of lakes/pond sampled and the number of sample results generated by VLAP each season. The QA/QC report will provide documentation on how the program met or did not meet QA/QC goals. In addition, the report will discuss problems that were encountered during the sampling season, and will provide solutions to these problems that will be implemented during the next sampling season. Per the NHDES Quality Management Plan, Section 9, this report will be provided to the DES QA Manager. The DES QA Manager will compile all of the Annual QA reports for each program at DES and will report to the senior leaders at DES (Refer to Section C for a distribution list).

B DATA GENERATION AND ACQUISITION ELEMENTS

B1 Sampling Process Designs (Experimental Design)

B1.1 Types and Number of Samples Required

Samples will be taken at the lake/pond deep spot, at the major inlets to the lake/pond, and the outlet. All samples taken will be water samples.

During the annual NHDES field audit/visit, duplicate samples will be collected by the volunteer monitors according to the outline below:

In-Lake Duplicates

One duplicate set of samples will be taken from the lower layer and will be analyzed for the following parameters:

- total phosphorus
- conductivity
- turbidity
- pH

The duplicate sample will be collected from the lower layer due to the probability that the lower layer sample is the in-lake sample that is most likely to be compromised (due to the bottom being stirred up by improper sampling technique).

In addition, one duplicate chlorophyll-a (composite or integrated tube, whichever is used by the volunteers) sample will be taken at the deep spot.

A duplicate dissolved oxygen/temperature measurement will be taken on a weekly basis during the sampling season by both the VLAP Coordinator and the VLAP Intern.

Tributary Sampling

One duplicate sample will be taken in an inlet and will be analyzed for the following parameters:

- total phosphorus
- conductivity
- turbidity
- pH

E.coli Testing

If the volunteer monitors wish to conduct *E. coli* testing, then one duplicate sample will be taken per season.

B1.2 Sampling Locations and Frequencies

SITE SELECTION FOR STREAM INLET MONITORING

Inlet monitoring sites will be selected close to the lake edge to account for all inputs to streams from the watershed. Stations will be established far enough upstream from lake edge so as to prevent lake effects or back-flushing into the stream.

SITE SELECTION FOR OUTLET MONITORING

A sample location is chosen at the outlet of the lake/pond to give a representative idea of the quality of the water that is leaving the lake/pond.

SITE SELECTION FOR IN-LAKE MONITORING

Each lake/pond will be monitored at the deepest spot. This location will be determined through pre-existing bathymetric maps generated by the NHDES Lake Survey Program. The deep spot is found using triangulation from fixed shoreline points, and the location is confirmed by conducting a simple depth measurement (lowering a Kemmerer bottle filled with water on a calibrated chain to check the depth). Some volunteer monitors also use fish finders and GPS units, in addition to the previously listed methods, to locate the deep spot. On the annual biologist visit, a dissolved oxygen/temperature profile is conducted at the deep spot to determine the distribution of thermal layers in the water column. Samples are collected at the mid-point of each thermal layer.

SAMPLING FREQUENCY

Since VLAP is voluntary program, the volunteers are not required to conduct a certain number of sampling events per season. NHDES recommends that volunteers sample at least once per month during the sampling season (June-August). In addition, as mentioned previously, the volunteer monitors are required to sample with a DES biologist at least once per season during an annual visit by the DES biologist on an annual visit.

B1.3 Sample Matrices

All samples collected through VLAP that will be analyzed in the laboratory will be water samples.

Analytical field data will be collected for the dissolved oxygen/temperature profile at the lake deep spot and for the in-lake clarity (as measured by Secchi Disk).

B1.4 Measurement Parameters of Interest

Samples collected in VLAP will be as follows:

INLETS AND OUTLETS

Total phosphorus
Conductivity
Turbidity
pH
Bacteria (optional)

DEEP SPOT (EACH THERMAL LAYER)

Total phosphorus
Conductivity
Turbidity
pH
Acid Neutralizing Capacity (upper layer only)
Chlorophyll-a*
Clarity (Secchi-disk transparency**)
Phytoplankton***

* = Volunteers may conduct chlorophyll-a sampling using an integrated sampler or by compositing. On the field data sheet, the volunteer is required to identify what method was used to collect the chlorophyll-a sample (Refer to Appendix C-2, C-5). If the monitor chooses to collect a composite sample, a 1-liter sample from each meter of the photic zone of the lake will be collected, mixed in a bucket, and poured into an amber 1-liter bottle.

** = Volunteers conduct a secchi-disk reading by lowering the disk into the water and recording at the depth in the water column where the disk can no longer be viewed.

*** = An 80-micron mesh net will be used to collect plankton from the bottom of the photic zone to the surface of the water on the annual Biologist visit. Volunteer monitors will not collect this sample when sampling without the DES biologist.

Table B1-1: Sample Location, Sampling and Analysis Methods/SOP Requirements

Sampling Location	Medium/ Matrix	Depth (Units)	Analytical Parameter	No. of Samples per sampling event	No. of Field Duplicates per Season	Sampling SOP (Appendix Reference)	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Inlets	Surface Water	Mid-depth	Total Phosphorus	1	1 per VLAP lake that collects inlet samples	C-2	250 mL amber plastic	1 mL Sulfuric Acid, pH<2 light protected 4°C	28 Days
	Surface Water	Mid-depth	Turbidity	1	1 per VLAP lake that collects inlet samples	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	Mid-depth	Conductivity	1	1 per VLAP lake that collects inlet samples	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	Mid-depth	pH	1	1 per VLAP lake that collects inlet samples	C-2	1-1L plastic	light protected 4°C	24 Hours
Anywhere in the lake or inlets/outlets	Surface Water	Mid-depth	E.coli	1	1 per VLAP lake that collects inlet samples	C-2	250 mL sterilized plastic	light protected 4°C	24 Hours

Sampling Location	Medium/ Matrix	Depth (Units)	Analytical Parameter	No. of Samples per sampling event	No. of Field Duplicates per Season	Sampling SOP (Appendix Reference)	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Outlet	Surface Water	Mid-depth	Total Phosphorus	1	0	C-2	250 mL amber plastic	1 mL Sulfuric Acid, pH<2 light protected 4°C	28 Days
	Surface Water	Mid-depth	Turbidity	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	Mid-depth	Conductivity	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	Mid-depth	pH	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
Epilimnion	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	Total Phosphorus	1	0	C-2	1- 250 mL amber plastic	1 mL Sulfuric Acid, pH<2 light protected 4°C	28 Days

Sampling Location	Medium/ Matrix	Depth (Units)	Analytical Parameter	No. of Samples per sampling event	No. of Field Duplicates per Season	Sampling SOP (Appendix Reference)	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Epilimnion	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	Turbidity	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	Conductivity	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	pH	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	ANC	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	Stratified lakes: from middle of metalimnion to surface Unstratified lakes: 2/3 depth to surface	Chl-a	1	1 per VLAP lake	C-2	1-1L plastic, amber	light protected 4°C	24 Hours

Sampling Location	Medium/ Matrix	Depth (Units)	Analytical Parameter	No. of Samples per sampling event	No. of Field Duplicates per Season	Sampling SOP (Appendix Reference)	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Water Column	Surface Water	from approx. 0.5 meters from the bottom to the surface	DO/temp profile	1	1 per week per VLAP coordinator and VLAP Intern	C-3	N/A	N/A	N/A
	Surface Water	Stratified lakes: from middle of metalimnion to surface Unstratified lakes: 2/3 depth to surface	Phytoplankton	One per season	0	C-4	250 mL glass bottle	Iodine light protected 4°C	Indefinite
Metalimnion	Surface Water	if lake/pond is deep enough to stratify into three layers	Total Phosphorus	1	0	C-2	1- 250 mL amber plastic	1 mL Sulfuric Acid, pH<2 light protected 4°C	28 Days
	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	Turbidity	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours

Sampling Location	Medium/ Matrix	Depth (Units)	Analytical Parameter	No. of Samples per sampling event	No. of Field Duplicates per Season	Sampling SOP (Appendix Reference)	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Metalimnion	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	Conductivity	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	pH	1	0	C-2	1-1L plastic	light protected 4°C	24 Hours
Hypolimnion	Surface Water	if lake/pond is deep enough to stratify into two or three layers depth determined on most recent annual biologist visit (mid-point of layer)	Total Phosphorus	1	1 per VLAP in-lake station	C-2	1- 250 mL amber plastic	1 mL Sulfuric Acid, pH<2 light protected 4°C	28 Days
	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	Turbidity	1	1 per VLAP in-lake station	C-2	1-1L plastic	light protected 4°C	24 Hours

Sampling Location	Medium/ Matrix	Depth (Units)	Analytical Parameter	No. of Samples per sampling event	No. of Field Duplicates per Season	Sampling SOP (Appendix Reference)	Containers (Number, size and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Hypolimnion	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	Conductivity	1	1 per VLAP in-lake station	C-2	1-1L plastic	light protected 4°C	24 Hours
	Surface Water	depth determined on most recent annual biologist visit (mid-point of layer)	pH	1	1 per VLAP in-lake station	C-2	1-1L plastic	light protected 4°C	24 Hours

B2 Sampling Methods

B2.1 Sample Collection Methods

Refer to Appendix C for SOPs associated with sampling collection procedures, field equipment maintenance, and sample preservation requirements. Table B2-1 identifies the sampling methods and equipment required to collect samples for each parameter, and provides an SOP reference table.

Table B2-1: Project Sampling SOP Reference and Equipment

Appendix Reference Number	Title	Originating Organization	Equipment Needed to Collect Sample
C-2	Standard In-lake Field Sample Collection Procedures	NHDES	VLAP Monitor's Field Manual
C-2	Standard Tributary Field Sampling Procedures	NHDES	VLAP Monitor's Field Manual
C-2	Clarity (Secchi Disk Transparency)	NHDES	In-lake Deep Spot Sampling: Secchi Disk
C-4	Plankton	NHDES	In-lake Deep Spot Sampling: Plankton Net
C-2	pH	NHDES	Inlet/Outlet Sampling: Grab Sample In-lake Deep Spot Sampling: Kemmerer Bottle
C-2	ANC	NHDES	In-lake Deep Spot Sampling: Kemmerer Bottle
C-2	Conductivity	NHDES	Inlet/Outlet Sampling: Grab Sample In-lake Deep Spot Sampling: Kemmerer Bottle
C-2	Turbidity	NHDES	Inlet/Outlet Sampling: Grab Sample In-lake Deep Spot Sampling: Kemmerer Bottle
C-2	Chlorophyll-a	NHDES	In-lake Deep Spot Sampling: Integrated Sampler or Composite Sampling
C-3	Temperature/Dissolved Oxygen	NHDES	In-lake Deep Spot Sampling: Dissolved oxygen/temperature meter
C-2	Total Phosphorus	NHDES	Inlet/Outlet Sampling: Grab Sample In-lake Deep Spot Sampling: Kemmerer Bottle
C-2	E. coli	NHDES	Inlet/Outlet Sampling: Grab Sampling In-Lake Sampling: Grab sample

B2.2 Cleaning and Decontamination of Equipment/Sample Containers

Information on cleaning SOPs can be found in the equipment cleaning SOPs in Appendix D-10. Field equipment will be rinsed free of any attached aquatic life or sediment when in the field.

B2.3 Sample Preparation and Holding Times

Table B1-1 references the selection and preparation of sample containers, sample volumes and preservation methods, and maximum sample holding times before analysis for each analytical parameter. In addition, the reference to the sample collection SOP for each analytical parameter is provided.

B2.4 Performance Requirements for Sampling Methods

When volunteers drop samples off at the laboratory, the laboratory staff will complete an easy to use one-page sample receipt checklist (Refer to Appendix D-14) to assess and document if the volunteer monitors followed proper sampling techniques when collecting the samples (as outlined in the VLAP Monitor's Field Manual which can be found in Appendix C-2). Corrective actions (including volunteer monitor re-training and, in certain severe cases, rejection of samples for analysis) will be implemented to minimize, and hopefully eliminate, future re-occurrences of improper sampling techniques. Table B2-2 supplements the sample receipt checklist and provides additional explanation and guidance for laboratory staff for assessing if proper sampling procedures were followed and what corrective actions, if necessary, should be implemented.

Table B2-2 Performance Requirements for Sampling Methods and Corrective Actions

SOP Appendix Reference Number	Sample Parameter	Person(s) Responsible for Collecting Sample	Sample Collection Non-conformance with SOP issue	Corrective action
C-2	Clarity (Secchi Disk Transparency)	Volunteer Monitors and VLAP Coordinator/VLAP Intern on biologist annual visit	1. At least two depth readings were not taken and averaged	A. Remind monitors to take at least two readings. B. Note on VLAP sample receipt checklist.
			2. Depths were reported in feet, not meters	A. Remind monitors to use a chain calibrated in meters and record depth in meters. B. Note on VLAP sample receipt checklist.
			3. Depths seem too great for the lake/pond, based on historical data	A. Contact volunteer monitors and discuss sampling conditions. B. Remind monitors not to use a viewing tube. C. Note on VLAP sample receipt checklist and in log-in system.

SOP Appendix Reference Number	Sample Parameter	Person(s) Responsible for Collecting Sample	Sample Collection Non-conformance with SOP issue	Corrective action
C-2	pH Conductivity ANC Turbidity	Volunteer Monitors and VLAP Coordinator/ VLAP Intern on biologist annual visit	1. Wrong sample bottle used	A. Do not analyze sample and remind monitors which bottles to use. B. Document on VLAP sample receipt checklist.
			2. Bottle not filled up to the neck of bottle with sample	A. Note on VLAP sample receipt checklist and in lab log-in system. B. Remind monitors to fill sample bottle to the neck of the bottle.
			3. Sediment or debris in bottle, or sample cloudy	A. Note on VLAP sample receipt checklist and in lab log-in system. B. Remind monitors to not disturb stream bottom and to not sample stagnant water.
C-2	Chlorophyll	Volunteer Monitors and VLAP Coordinator/ VLAP Intern on biologist annual visit	1. Wrong sample bottle used	A. Do not analyze sample and remind monitors which bottles to use. B. Note on VLAP sample receipt checklist.
			2. Bottle not filled up to the neck of bottle with sample	A. Note on VLAP sample receipt and in lab log-in system. B. Remind monitors to fill sample bottle to the neck of the bottle.
C-2	Total Phosphorus	Volunteer Monitors and VLAP Coordinator/ VLAP Intern on biologist annual visit	1. Wrong sample bottle used	A. Do not analyze sample and remind monitors which bottles to use. B. Note on VLAP sample receipt checklist.
			2. Bottle not filled up to the neck of bottle with sample	A. Note on VLAP sample receipt checklist and in lab log-in system. B. Remind monitors and staff to fill sample bottle to the neck of the bottle.
			3. The pH of the sample is greater than 2 when checked in the laboratory	A. Add acid immediately. B. Note on VLAP sample receipt checklist and in lab log-in system. C. Remind staff to treat TP bottles with proper acid. D. Remind monitors not to overfill bottles, and to make a note on the field data sheet when overflow occurs.

SOP Appendix Reference Number	Sample Parameter	Person(s) Responsible for Collecting Sample	Sample Collection Non-conformance with SOP issue	Corrective action
C-2	E.coli	Volunteer Monitors and VLAP Coordinator/ VLAP Intern on biologist annual visit	1. A sterilized sample bottle was not used	A. Do not analyze sample and remind monitors which bottles to use. B. Note on VLAP sample receipt checklist.
			2. Bottle not filled up to the neck of bottle with sample	A. Note on VLAP sample receipt checklist and in lab log-in system. B. Remind monitors and staff to fill sample bottle to the neck of the bottle.
			3. Sediment or debris in bottle, or sample cloudy	A. Note on VLAP sample receipt checklist and in lab log-in system. B. Remind monitors to not disturb stream bottom and to not sample stagnant water.
C-4	Plankton	VLAP Coordinator/ VLAP Intern on biologist annual visit	1. Iodine (Lugols solution) not added to sample for preservation	A. Note on VLAP sample receipt checklist and in lab log-in system. B. Add iodine immediately upon discovery of error and note on data sheet.
C-3	Temperature/ DO profile	VLAP Coordinator/ VLAP Intern on biologist annual visit	1. Profile results do not look typical for that particular type of lake/pond	A. Ask staff person if meter was calibrated immediately prior to use. B. If meter was calibrated, it is possible that meter was not functioning properly. Note on data sheet and inspect meter for bubble in probe and check battery.
C-2	All samples	Volunteer Monitors and VLAP Coordinator/ VLAP Intern on biologist annual visit	1. No attempt was made by volunteer monitor to “cool” samples during the time period after collection and until brought to the lab.	A. Do not analyze samples. B. Note on VLAP sample receipt checklist. C. Remind monitors to “cool” samples immediately after collection until samples are brought to the lab.
			2. Samples returned to the lab more than 24 hours after collection and before 48 hours after collection.	A. Note on VLAP sample receipt checklist and in lab log-in system. B. Remind monitors to bring samples in within 24-hours.
			3. Samples returned to lab more than 48 hours after collection.	A. Do not run samples. B. Note on VLAP sample receipt checklist and in log-in system. C. Remind monitors to return samples within 24 hours.
			4. Samples not labeled correctly	A. Note on VLAP sample receipt checklist B. Contact monitors to solve problems. C. Remind monitors how to label sample bottles.

SOP Appendix Reference Number	Sample Parameter	Person(s) Responsible for Collecting Sample	Sample Collection Non-conformance with SOP issue	Corrective action
C-2	In-lake Deep Spot Samples	Volunteer Monitors and VLAP Coordinator/ VLAP Intern on biologist annual visit	1. Samples taken at the wrong depths	A. Note on VLAP sample receipt checklist and in lab log-in sheet. B. Remind monitors at which depths to sample.
C-2, C-5, C-6, C-7, C-8	Sample Field Data Sheets	Volunteer Monitors and VLAP Coordinator/ VLAP Intern on biologist annual visit	1. Field data sheets not returned or not filled out properly	A. Note on VLAP sample receipt checklist. B. Contact the monitors for the missing information. C. Remind monitors to fill out all required parts of the field data sheets.

B3 Sample Handling and Custody

B3.1 Sample Collection Documentation

FIELD NOTES

Field notes will be taken by the NHDES Staff and the volunteer monitors on NHDES VLAP issued field-sampling sheets (Refer to Appendix C-5 and C-6). Data collected on the field sheets will include the following information:

- Site name and location
- Field monitor name(s) and information
- Field monitor documentation of sampling qualifications
- Sample date/time
- Weather conditions
- Site observations
- Station location
- Secchi disk depth (in-lake only)
- Temp/DO Profiles (the DES biologist conducts this test only)

FIELD DOCUMENTATION MANAGEMENT SYSTEM

Field sheets will be used as described above. Volunteer monitors or NHDES staff will complete each task-specific field sheet in the field and turn the sheet in to the Satellite Laboratory Manager or Interns or NHDES Limnology Center staff when samples are delivered to the laboratory. The Satellite Laboratory Managers and the VLAP Coordinator will be responsible for tracking these field sheets, and making sure that the data is entered into a database. On a weekly basis during the sampling season, the Satellite Laboratory Managers will send a copy of the field data sheets and the data results report for the lakes/ponds using the satellite laboratories to the VLAP Coordinator. The VLAP Coordinator will keep all of the field data sheets on file at NHDES.

B3.2 Sample Handling and Tracking System

The volunteer monitors will use a single field sample collection form for “routine VLAP sampling” to identify and track samples collected in the field. When the routine VLAP sampling reveals that a particular parameter is elevated in an inlet, the VLAP Coordinator may recommend that “stream survey sampling” be conducted along the inlet. The volunteer monitors will use and a single field sample collection form for “stream survey sampling” to identify and track samples collected in the field.

IN THE FIELD

“Routine VLAP Sampling”:

Sample bottles are labeled in the field with waterbody name/town, sample location, sample date, sample time, and the collector’s initials. Inlet and outlet stations are typically named using the established local name of the inlet or outlet (which is typically listed on a USGS topographic

map of the area, or is a local name known to the volunteers). The samples taken from the thermal layers at the deep spot are named “epilimnion”, “metalimnion”, and “hypolimnion”). Once established, the name of a sampling location is generally not changed from sampling season to sampling season to ensure consistency for data management and reporting purposes.

No new station naming conventions are assigned to the field samples unless duplicate samples are collected, or if a new station is created. If a duplicate sample is taken, then the duplicate sample bottle is named with the established station name and the word “duplicate” is also written on the sample bottle. If a new station is created and sampled, then the station is given a name (which is generally the name assigned to the stream on the USGS topographic map of the area, or a local name known to the volunteers), and the volunteers will document this new station on the field data sheet (refer to Appendix C-5). Starting with the 2002 sampling season, efforts will be made by the VLAP Coordinator and the VLAP Intern to document, in written text and with maps, the location and directions to each sampling station at each lake/pond participating in VLAP. A station ID form will be filled out for each station and will be kept on file at NHDES and with each lake Association so that each station will be able to be accurately located in the field by DES staff and volunteer monitors in the future (Refer to Appendix C-9 for the Sampling Station Identification Form). In addition, station information will eventually be entered in to the NHDES Watershed Management Bureau Water Quality database and GIS coverage.

The volunteer monitors will fill out the VLAP Field Data Sheet show in Appendix C-5 when collecting samples and will return this sheet to the satellite laboratory or NHDES Limnology Center with the samples.

Water samples will be placed on ice and/or ice packs in a cooler immediately after collection and transported to the appropriate satellite laboratory or the NHDES Limnology Center in less than 24 hours after sample collection for analysis.

“Stream Survey Sampling”:

When the routine VLAP sampling at the major inlets to the lake/pond reveals that a particular water quality parameter is elevated (based on the comparison of the data to historical data for that station, and established state means for the data), then the VLAP Coordinator may recommend that the volunteer monitors conduct additional sampling along the inlet. Specifically, the VLAP Coordinator may recommend that the volunteer monitors sample along the inlet using the “bracketing technique” so that any locations/sources that may be causing the water quality parameter to be elevated may be pinpointed. The volunteer monitors will be trained in how to collect samples using the “bracketing technique” by NHDES staff.

Sample bottles are labeled in the field with waterbody name/town, sample location, sample date, sample time, and the collector’s initials. The samples collected along a particular Inlet are typically named using a two-tiered approach. First, the established local name of the inlet or outlet (which is typically listed on a USGS topographic map of the area, or is a local name known to the volunteers) is used. This name will be followed by a dash and then a number. As the distance along the stream from the lake increases, the number will increase. For example, the first sample taken on White Brook closest to the inlet to the lake would be labeled “White Brook - 1”, then second sample taken upstream of the first sample would be named “White Brook - 2”,

and so on along the stream. The volunteer monitors will provide a description of each station on the VLAP Stream Survey Sheet, and will mark each sampling location on a map. Once established, the name of a sampling location is generally not changed from sampling season to sampling season to ensure consistency for data management and reporting purposes.

The volunteer monitors will fill out the VLAP Stream Survey data sheet show in Appendix C-6 when collecting samples and will return this sheet along with a map to the laboratory with the samples.

Water samples will be placed on ice in a cooler immediately after collection and transported in less than 24 hours to the appropriate satellite laboratory or the NHDES Limnology Center for analysis.

IN THE LABORATORY:

Each sample collected in the field is checked, using the VLAP sample receipt checklist to ensure that the proper standard field operating procedures were followed (Refer to Appendix D-14), and then is logged into a computer database system Log-In system (which was developed using the software Microsoft Access 2000) in the Satellite Laboratory or in the NHDES Limnology Center, which prints out a label for each sample. The label contains information such as waterbody name/town, sample location, sample date, sample time, collectors' initials, lake/pond EPA account number, log-in date and time, and the parameters to be run on the sample. An example of the label is shown in Appendix D-13. A log-in sheet is printed out for the samples for each lake/pond, as show in Appendix D-12. The temperature of the samples and the pH of the total phosphorus samples is checked and recorded on the log-in sheet.

This login system also assigns a number to the sample, which is tracked through both the NHDES Limnology Center Laboratory and the Laboratory Services Unit, as well as at the Satellite Laboratories (Refer to Appendix D-13). These numbers are assigned in consecutive order in a database as samples are logged in, starting with the year, followed by the sample number in the system (e.g., 2002-XXXX). (Note: In order to avoid confusion with duplicate sample numbers between the NHDES Limnology Center and Satellite laboratory log-in systems, at the Franklin Pierce Satellite Laboratory the numbers are assigned as F2002-XXXX, and at the Lake Sunapee Regional Laboratory, the numbers are assigned as S2002-XXXX.)

All samples are required to be “cooled” on ice in the field and between laboratories. In the laboratory, samples are warmed to 25°C for analyses. Refer to Table B2-2 or Appendix C-2 and Appendix D for sample container, volume, and preservation information and holding time information.

When samples are transferred from the NHDES Limnology Center to the NHDES Laboratory Services Unit, they are listed on a transfer sheet by station location, sample number, matrix, and analytical parameter. An area for signing off for custody is included on the lab sheet, as shown in Appendix D-12.

Figure B3-1 summarizes the sampling handling, tracking, and custody channel that all samples go through in the NHDES Limnology Center. The Limnology Center personnel, supervised by the QA/QC officer for the NHDES Limnology Center laboratory, conduct sample archival activities. Figure B3-2 summarizes the sampling handling and tracking, that all samples go through in the Satellite Laboratories. The Satellite Laboratory Interns, supervised by the Laboratory Manager (who is ultimately supervised by the QA/QC officer for the NHDES Limnology Center laboratory), conduct sample archival activities. Sample disposal is down the sink unless (most are just surface water lake samples) otherwise specified in the SOPs in Appendix D.

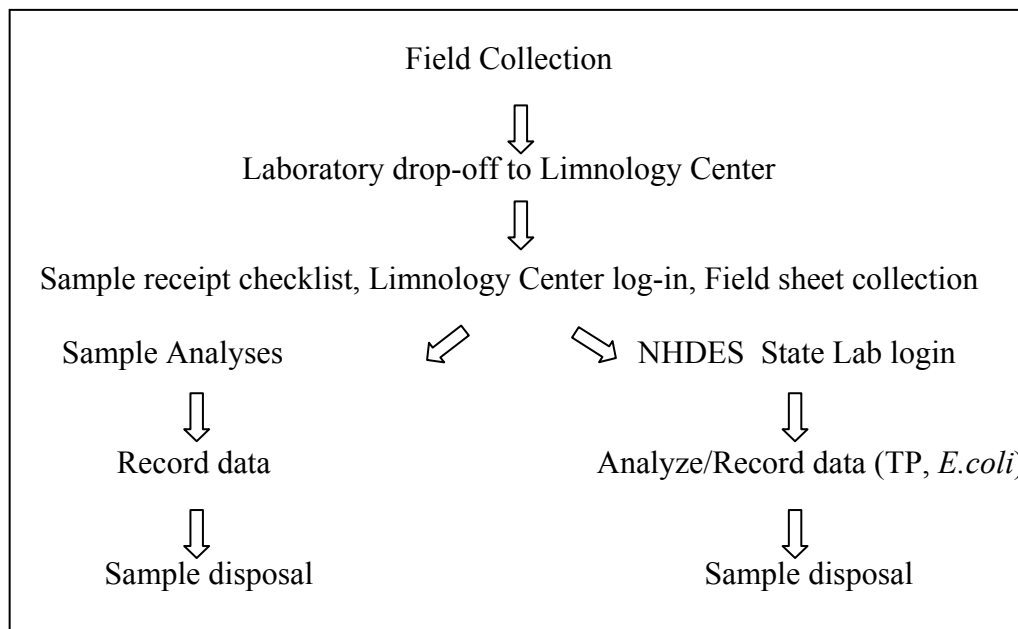


Figure B3-1: NHDES Limnology Center Sampling Handling/Tracking/Custody Summary Flow Diagram

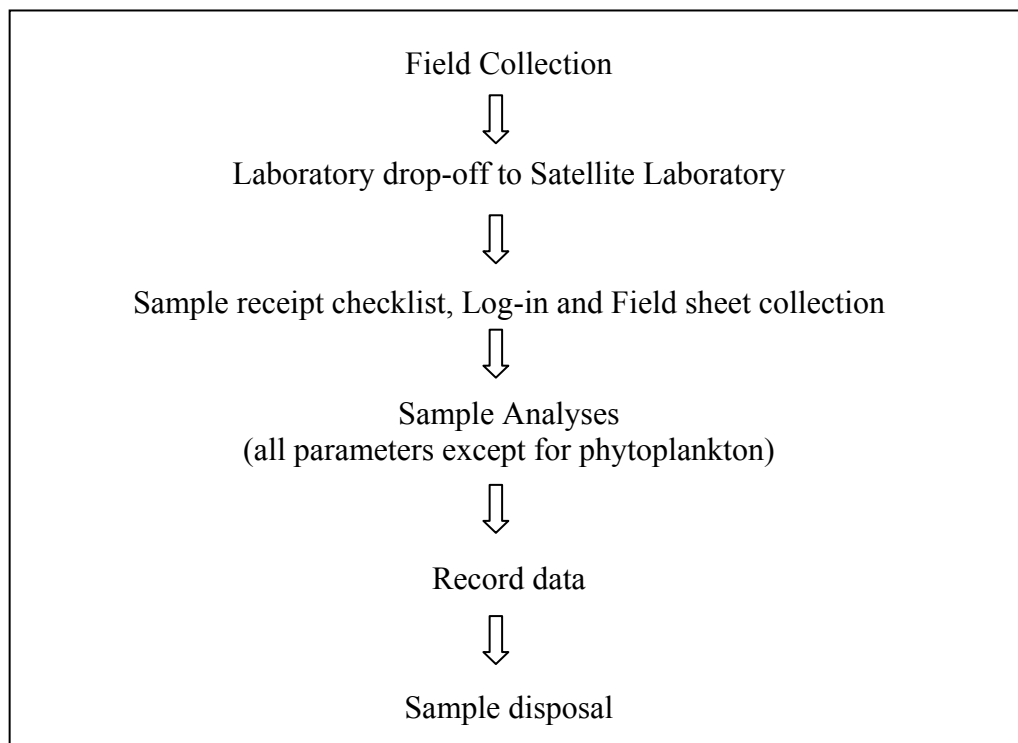


Figure B3-2: NHDES VLAP Satellite Laboratory Sampling Handling/Tracking/Custody Summary Flow Diagram

B3.3 Sample Custody

Refer to Figure B3-1 above for a flow chart showing sample custody in the NHDES Limnology Center and the NHDES Laboratory Services Unit. Chain of custody is monitored through the use of field data sheets (Refer to Appendix C-5, C-6, C-7, C-8, C-9) and laboratory log-in sheets described above and exemplified in Appendix D-12. Refer to Figure B3-2 above for a flow chart showing sample custody in the Satellite Laboratories.

B4 Analytical Methods

B4.1 Field Analytical Methods and Equipment Required

Refer to Appendix C for field method SOPs. Refer to table See Table B4-1 for a Field Analytical Method/SOP Reference Table.

Table B4-1: Field Analytical Method/SOP Reference Table

SOP Reference Number	Title	Originating Organization	Equipment Identification
C-3/D-8	Temperature/Dissolved Oxygen	NHDES	Meter
C-2	Clarity (Secchi Disk Transparency)	NHDES	Secchi Disk

B4.2 Fixed Analytical Methods and Equipment Required

Table B4-2 identifies the analytical methods and equipment used to analyze samples in the laboratory, and provides a reference to the appropriate analytical SOP.

Table B4-2: Fixed Laboratory Analysis Analytical Method/SOP Reference Table

Appendix Reference Number	SOP Title	Originating Organization	Equipment Identification
D-6	Total Phosphorus	NHDES	Laboratory Equipment/Auto analyzer
D-4	Turbidity	NHDES	Meter
D-3	Conductivity	NHDES	Meter
D-1	pH	NHDES	Meter
D-2	ANC	NHDES	Meter/Titration
D-5	Chlorophyll-a	NHDES	Integrated Sampler
D-9	Plankton	NHDES	Microscope
D-7	E.coli	NHDES	Laboratory Equipment/Meter

B4.3 Laboratory Decontamination Procedures and Materials

Laboratory decontamination procedures and materials are outlined in the Daily Procedures Section of the Limnology Center and VLAP Satellite Lab's lab Manuals. The procedures can be found in Appendix D.

B4.4 Waste Disposal Requirements

Acetone is the only hazardous waste produced as part of the VLAP program. The NHDES Limnology Center disposes its acetone waste through NHDES Laboratory Service's hazardous waste collection and disposal system. The VLAP satellite labs dispose of the acetone waste in accordance with the waste disposal requirements of Franklin Pierce College and Colby Sawyer College.

B4.5 Specific Performance Requirements

For specific performance requirements for each analyte of concern, refer to Tables B5-1 through B5-3.

B5 Quality Control

B5.1 Sampling Quality Control

Analytical parameters do not have multiple analytes, therefore a field sampling SOP precision and accuracy table is not needed here.

B5.2 Field Analytical Quality Controls

Table B5-1 and B5-2 summarizes field analytical QCs.

Analytical parameters do not have multiple analytes, therefore a field analytical method/SOP precision and accuracy table is not necessary here.

No field screening techniques are used.

B5.3 Fixed Laboratory Quality Controls

Tables B5-3 A–H summarize fixed laboratory QCs.

Analytical parameters do not have multiple analytes, therefore a field analytical method/SOP precision and accuracy table is not necessary here.

All required analytical QCs shall be conducted according to EPA-NE required frequencies.

Table B5-1: Field QC Samples and Frequency Table

Matrix	Analytical Parameter	Field QC	Data Quality Indicators	Acceptable Limits	Corrective Action	Responsible Person	Frequency
Surface Water/	TP Conductivity Turbidity Chl-a E.coli	Trip Blank	Contamination (Accuracy/Bias)	No target compounds greater than QL	-Clean bottles -Retest -Assess Laboratory bottle cleaning procedures	VLAP Coordinator	15% per parameter
Surface Water	TP Conductivity Turbidity pH Chl-a	Field Duplicates	Precision	RPD<20%	-Assess laboratory operations and precision -Flag data as questionable in annual report	NHVLP Coordinator	15% per parameter
Surface Water	E.coli	Field Duplicates	Precision	RPD<20%	-Assess laboratory operations and precision -Flag data as questionable in annual report	NHVLP Coordinator	15% per parameter
Surface Water	DO	Field Duplicates	Precision	+/- 10% %Saturation +/- 2 mg/L	-Inspect Meter and probe-determine if inaccurate measurements were made -Repeat Measurements	NHVLP Coordinator	25% of field measurements

Table B5-2: Field Analytical QC Sample Table for Dissolved Oxygen (NHDES)

Medium/Matrix	Surface Water				
Sampling SOP	C-2				
Analytical Parameter	Temperature/Oxygen				
Analytical Method/ SOP Reference	D-8				
Field Analytical Organization	NHDES				
Sample Locations	Deep spot				
Laboratory QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Other: Field duplicate/replicate	25%	+/- 10% % Saturation +/- 2 mg/L	Change Batteries check membrane Reanalyze	VLAP Coordinator or VLAP intern	Analytical Precision

Table B5-3A: Fixed Laboratory Analytical QC Sample Table for Total Phosphorus (DES Laboratory Services)

Medium/Matrix	Surface Water			
Sampling SOP	C-2			
Analytical Parameter ¹	Total Phosphorus DES Laboratory Services			
Analytical Method/ SOP Reference*	Lachat Quick-Chem Method 10-115-01-1-F/ D-6			
Field Analytical Organization	NHDES			
Sample Locations	Inlets, Outlets, deep spot (each thermal layer)			
Laboratory QC:	Frequency/Number	Method/SOP QC Acceptance Limits ²	Corrective Action (CA)	Person(s) Responsible for CA
Method Blank	See reagent blank		See acceptance criteria section of the SOP. Samples re-analyzed until QC is acceptable or data flagged.	Analyst, section supervisor, QC officer
Reagent Blank	1 per run	<MDL		
Laboratory Duplicate	1 out of 8	Range = 0-0.004		
Laboratory Matrix Spike	10%	82-114%		
LCS	2 read after calibration and at end of run	+/- 20% of 0.005		
LFB	1 per run	+/- 10% of 0.050		
Other: ICV	1 per run	+/- 10% of 0.100		

Table B5-3B: Fixed Laboratory Analytical QC Sample Table for Total Phosphorus (VLAP Satellite Labs)

Medium/Matrix	Surface Water
Sampling SOP	C-2
Analytical Parameter	Total Phosphorus VLAP Satellite Labs
Analytical Method/ SOP Reference	D-6
Field Analytical Organization	NHDES Staff/Trained Volunteers
Sample Locations	Inlets, Outlets, deep spot (each thermal layer)

Laboratory QC:	Frequency/Number	Method/SOP QC Acceptance Limits ¹	Corrective Action (CA)	Person(s) Responsible for CA
Method Blank	See reagent blank		Samples re-analyzed until QC is acceptable, or Lab Manager or QA Officer identify any interference that caused the unacceptable results. Appendix D-15	Lab Manager, QA officer
Reagent Blank	1 per run	<MDL		
Laboratory Duplicate	1 out of 10	Range = 0-0.004		
Laboratory Matrix Spike	1 per tray per matrix ²	82-114%		
Initial Calibration	1 per run	$r^2 > .995$		
Calibration Verification Check	1 per run	+/- 20% of 0.005; +/- 10% of 0.050, 0.100, and 0.200		
Continuing Calibration Verification	1 per tray other than Calibration Verification Tray	+/- 10% of 0.050		

¹Method/SOP QC acceptance limits are equal to measurement performance criteria

²VLAP Satellite labs define a matrix as all dry weather in-lake and inlet samples. Rain event and Volunteer River Assessment Program samples would be considered a different matrix.

Table B5-3C: Fixed Laboratory Analytical QC Sample Table for pH (NHDES Limnology Center and Satellite Labs)

Medium/Matrix	Surface Water				
Sampling SOP	C-2				
Analytical Parameter ¹	pH-NHDES Limnology Center and VLAP Satellite Labs				
Analytical Method/ SOP Reference*	D-1				
Field Analytical Organization	NHDES Staff/Trained Volunteers				
Sample Locations	Inlets, Deep Spot, Outlets				
Laboratory QC:	Frequency/Number	Method/SOP ¹ QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Laboratory Duplicate	10%	+/- .5 pH units	Reanalyze (Appendix D-15)	Analyst	Analytical Precision
Internal Standards (ISs)	N/A				
Other: Initial Calibration	After initial instrument set-up and when calibration verification fails	Per instrument acceptance or +/- .1 pH unit	Recalibrate	Analyst	Accuracy
CCV	10%	+/- .1 pH unit	Recalibrate (Appendix D-15)	Analyst	Accuracy

¹Method/SOP QC acceptance limits are equal to measurement performance criteria

Table B5-3D: Fixed Laboratory Analytical QC Sample Table for ANC (NHDES Limnology Center and Satellite Labs)

Medium/Matrix	Surface Water
Sampling SOP	C-2
Analytical Parameter	Alkalinity- NHDES Limnology Center and VLAP Satellite Labs
Analytical Method/ SOP Reference	D-2
Field Analytical Organization	NHDES Staff/Trained Volunteers
Sample Locations	Deep Spot: Epilimnion only

Laboratory QC:	Frequency/Number	Method/SOP ^{1&2} QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Laboratory Duplicate	10%	+/-1.20	Reanalyze (Appendix D-15)	Analyst	Analytical Precision

¹Method/SOP QC acceptance limits are equal to measurement performance criteria

²Since initial pH reading is documented in pH section of pH/ANC bench book when measuring ANC, the initial pH reading will be subject to the QC requirements of Table B5-4

Table B5-3E: Fixed Laboratory Analytical QC Sample Table for Conductivity (NHDES Limnology Center and Satellite Labs)

Medium/Matrix	Surface Water				
Sampling SOP	C-2				
Analytical Parameter	Conductivity- NHDES Limnology Center and VLAP Satellite Labs				
Analytical Method/ SOP Reference	D-3				
Field Analytical Organization	NHDES/Trained Volunteers				
Sample Locations	Inlets, Deep Spot, Outlets				
Laboratory QC:	Frequency/Number	Method/SOP ¹ QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Laboratory Duplicate	10%	+/-10%	Reanalyze (Appendix D-15)	Analyst	Analytical Precision
Other: Initial Calibration	After initial setup and when CCV Fails	Per instrument criteria	Recalibrate	Analyst	Accuracy
CCV	10%	+/- 10%	Recalibrate (Appendix D-15)	Analyst	Accuracy

¹Method/SOP QC acceptance limits are equal to measurement performance criteria

Table B5-3F: Fixed Laboratory Analytical QC Sample Table for Turbidity (NHDES Limnology Center and Satellite Labs)

Medium/Matrix	Surface Water				
Sampling SOP	C-2				
Analytical Parameter	Turbidity- NHDES Limnology Center and VLAP Satellite Labs				
Analytical Method/ SOP Reference	D-4				
Field Analytical Organization	NHDES/Trained Volunteers				
Sample Locations	Inlets, Deep Spot, Outlets				
Laboratory QC:	Frequency/Number	Method/SOP ¹ QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Laboratory Duplicate	10%	0-20 NTU, +/-1 >20-100 NTU, +/-3 >100 NTU, +/- 10	Reanalyze (Appendix D-15)	Analyst	Analytical Precision
Initial Calibration	Daily and after CCV failure	Per meter SOP	Recalibrate	Analyst	
CCV	10%	+/- 10%	Recalibrate (Appendix D-15)	Analyst	Accuracy

¹Method/SOP QC acceptance limits are equal to measurement performance criteria

ANDY – ARE WE DOING THE METHOD BLANKS?!

Table B5-3G: Fixed Laboratory Analytical QC Sample Table for Chlorophyll-a (NHDES Limnology Center and Satellite Labs)

Medium/Matrix	Surface Water				
Sampling SOP	C-2				
Analytical Parameter ¹	Chlorophyll-a- NHDES Limnology Center and VLAP Satellite Labs				
Analytical Method/ SOP Reference	D-5				
Field Analytical Organization	NHDES/Trained Volunteers				
Sample Location	1 taken at Deep spot				
Laboratory QC:	Freq./Number	Method/SOP ¹ QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Instrument Blank	One per analytical shift	N/A	Instrument Correction	Instrument	Accuracy/Bias (contamination)
Method Blank	10% or weekly	>MDL	Inspect bottles and filtering equipment for contamination	Analyst	Accuracy/Bias (contamination)
Laboratory Duplicate	10%	+/- 3 ug/L	Review Bench book sample information	Analyst	Analytical Precision
Calibration Verification Check (Turner Low Cal Standard)	Quarterly	+/- 10%	Reanalyze standard	Analyst	Accuracy/Bias
Calibration Verification Check (NIST Test # SRM2031)	Annual	Within Manufacturer's Tolerance(s)	Adjust as required to meet manufacturer's specifications and tolerances	QAQC Officer	Accuracy/Bias

¹Method/SOP QC acceptance limits are equal to measurement performance criteria

Table B5-3H: Fixed Laboratory Analytical QC Sample Table for Plankton (NHDES Limnology Center)

Medium/Matrix	Surface Water				
Sampling SOP	C-4				
Analytical Parameter ¹	Plankton				
Analytical Method/ SOP Reference*	D-9				
Field Analytical Organization	NHDES				
No. of Sample Locations	1 per season at the deep spot				
Laboratory QC:	Freq./Number	Method/SOP QC Acceptance Limits²	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Internal Standards (ISs)	N/A				

Table B5-3I: Fixed Laboratory Analytical QC Sample Table for E.coli (NHDES and VLAP Satellite Laboratories)

Medium/Matrix	Surface Water				
Sampling SOP	C-2				
Analytical Parameter	E.coli				
Analytical Method/ SOP Reference	D-7				
Field Analytical Organization	NHDES				
\ Sample Locations	optional Inlets, Outlets, In- lake locations				
Laboratory QC:	Frequency/Number	Method/SOP QC Acceptance Limits¹	Corrective Action (CA)	Person(s) Responsible for CA	Laboratory QC:
Method Blank	1 per run	0 counts	Run data is flagged as questionable	Lab Manager, QC officer	Method Blank
Laboratory Duplicate Count	10%	+/- 5% of own count, 10% of other's count	Recount and inspect plate to determine cause of imprecision	Analyst, Lab Manager	Laboratory Duplicate

¹Method/SOP QC acceptance limits are equal to measurement performance criteria

B6 Instrument/Equipment Testing, Inspection, and Maintenance

The fixed laboratory instrument/equipment testing and maintenance for VLAP consists of an outside contractor and internal responsibility components. The Limnology Center and Lake Sunapee Region Laboratory at Colby Sawyer College spectrophotometers, as well as the UV/VIS meter of the Franklin Pierce College Laboratory, will be inspected prior to the sampling season on an annual basis by an outside contractor. Any deficiencies will be corrected prior to the sampling season. Certificates of tolerance conformance will be kept on file with the Limnology Center QA/QC Officer. Less complex instruments will be checked and inspected by the analysts prior to use and acceptance tested via calibration, continuing calibration verifications, and lab duplicates.

Field Instrument/Equipment will be inspected prior to the sampling season on an annual basis. Any deficiencies will be corrected prior to the sampling season. Field Instrument/Equipment will be tested/maintained/inspected during the sampling season according to Table B6-1.

B6.1 Field Instrument/Equipment Testing, Inspection, and Maintenance

Table B6-1: Field Equipment Maintenance, Testing and Inspection

Sampling Equipment	Maintenance Activity	Testing/Inspect Activity	Responsible Person	Frequency	Acceptable Criteria	Corrective Action	SOP
Temp/DO Meter	Change Battery	Battery Check Calibration	VLAP Coordinator VLAP Intern	Prior to each use	Calibration	Send back to company	C-8
Temp/DO Meter	Change Membrane	Check probe for air bubbles	VLAP Coordinator VLAP Intern	Prior to each use	No bubbles	Send back to company	C-8
Plankton Net	Replace Net	Check net for holes	VLAP Coordinator VLAP Intern	Prior to each use	No holes	Replace net	D-9
Integrated Sampler	Replace Tube	Check tube for holes	VLAP Coordinator VLAP Intern	Prior to each use	No holes	Replace Tube	C-2
Kemmerer Bottle	Replace closing mechanism	Check tube for leaks	VLAP Coordinator VLAP Intern	During each use	No leaks	Replace closing mechanism	C-2
Calibrated Chain	Replace depth markers on chain	Check chain for depth markers at every 0.5 meters	VLAP Coordinator VLAP Intern	During each use	No missing depth markers	Replace missing markers	C-2

B6.2 Fixed Laboratory Instrument/Equipment Testing, Inspection, and Maintenance

Table B6-2: Fixed Laboratory Equipment Maintenance, Testing and Inspection

Sample Analysis Equipment	Maintenance Activity	Testing/Inspect Activity	Responsible Person	Frequency	Acceptable Criteria	Corrective Action	SOP
pH meters	Change pH probe	Check probe for cracks and gel level	Analyst	Prior to each use	Calibration	Replace probe	D-1
Turbidity meters	Change sample cell	Inspect cell for scratches	Analyst	Prior to each use	Scratch free sample cell	Replace cell	D-4
Conductivity Meters	Change conductivity probe	Inspect probe for flaking	Analyst	Prior to each use	Calibration	Replace probe	D-3
Spectrophotometers	General Cleaning	Calibration check	Limnology Center QA/QC Officer	Annual	Calibration within manufacturers tolerances	Per contractor recommendations	N/A
UV/VIS Meter	General Cleaning	Calibration check	FPC Laboratory Manager	Annual	Calibration within manufacturers tolerances	Per contractor recommendations	N/A
E.coli/Chl-a Vacuum flask	Emptying vacuum flask	Vacuum flask volume check	Analyst	Prior to each use	$\frac{3}{4}$ full flask	Empty flask	N/A

B7 Instrument/Equipment Calibration and Frequency

B7.1 Field Equipment Calibration

The SOPs in Appendix C-3 detail field meter calibration methods. Table B7-1 summarizes the field sampling equipment calibrations.

Table B7-1: Field Analytical Instrument Maintenance and Calibration Table

Equipment	Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Temp/DO meter	Per manual	Each use	Calibration to 100% saturation	<ul style="list-style-type: none"> - Check battery - Wet sponge - Check for bubbles 	<ul style="list-style-type: none"> - Field personnel - VLAP Coordinator - VLAP Intern 	C-3

B7.2 Laboratory Equipment Calibration

Table B7-2 summarizes the field sampling equipment maintenance, testing and inspection procedures.

Table B7-2: Fixed Laboratory Analytical Instrument Maintenance and Calibration Table

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	Method/ SOP Reference
TP	Per method described in method SOP	Per method described in method SOP	Each Day	Calibrate to known calibration standards	Check standards, recalibrate	NHDES - Rachel Rainey Satellite Laboratories – Lab Manager	D-6
E.coli	Per method described in method SOP	Per method described in method SOP	Each Day	Calibrate to known calibration standards	Check standards, recalibrate	NHDES - Rachel Rainey Satellite Laboratories – Lab Manager	D-7
pH	Per method described in method SOP	Per method described in method SOP	Each Day	Calibrate to known calibration standards	Check standards, recalibrate	Limnology Center or Satellite lab Personnel	D-1
Conductivity	Per method described in method SOP	Per method described in method SOP	Each Day	Calibrate to known calibration standards	Check standards, recalibrate	Limnology Center or Satellite lab Personnel	D-3
Turbidity	Per method described in method SOP	Per method described in method SOP	Each Day	Calibrate to known calibration standards	Check standards, recalibrate	Limnology Center or Satellite lab Personnel	D-4
Chlorophyll-a	Per method described in method SOP	Per method described in method SOP	Each Day	Calibrate to known calibration standards	Check standards, recalibrate	Limnology Center or Satellite lab Personnel	D--5
Plankton	N/A	N/A	N/A	N/A	N/A	N/A	D-9

B8 Inspection/Acceptance of Supplies and Consumables

B8.1 Standard materials and solutions, reagents, hoses, deionized water, electronic data storage media

Standard materials and solutions, and reagents, and will be inspected by the Limnology Center QA/QC Officer and Satellite Lab Managers upon receipt to verify that proper materials were shipped. Deionized water systems will be tested prior to each sampling season, with any deficiencies resolved prior to the sampling season. Documentation of the deionized water testing and corrective action as needed, will be kept on file with the NHDES Limnology Center QA/QC Officer.

B8.2 Sample Bottles

Sample bottles will be examined by NHDES Limnology Center staff and Satellite Laboratory staff prior to use. The VLAP Coordinator, the VLAP Intern, and the volunteer monitors will bring extra sample bottles in the field in the event that contamination or damage of a sample bottle occurs.

B9 Non-direct Measurements

The only type of data needed for the implementation of VLAP that is not obtained from monitoring activities directly associated with VLAP is a lake bathymetric map. Lake bathymetric maps are used to help locate the deep spot of the lake/pond, and the inlets and outlets, so that the biologists and volunteer monitors know where to conduct sampling activities. The staff biologists of the NHDES Lake Survey Program have generated these bathymetric maps. Specifically, since 1975, the NHDES Lake Survey Program has surveyed the majority of the lakes in the state using fathometers and transect lines to generate bathymetric maps. The VLAP Coordinator assumes that the location of the deepest spot of the lake shown on the bathymetric map is accurate, unless the volunteer monitors can physically prove that there is a deeper spot in the lake during the annual biologist visit.

B10 Data Management

B10.1 Project Data Management Process

FIELD DATA COLLECTION

The Volunteer Monitors and the VLAP Coordinator and VLAP Intern will record measurements and field observations on the VLAP field data sheet shown in Appendix C-5 and C-6 while collecting samples in the field. Field recordings will be made in ink. Field recordings will be made in ink. The data being collected in the field will be collected following the procedures outlined in the NH Department of Environmental Services' Quality Management Plan, Section 8. Field data sheets shown in Appendix C-5, C-6, C-7, C-8, and C-9 will be used to record field data.

On the annual biologist visit to the lake/pond, the VLAP Coordinator or the VLAP intern will record the dissolved oxygen/temperature profile on a field data sheet (as show in Appendix C-8) and will also prompt the oxygen meter to store the data. Upon returning to the lab, the VLAP Coordinator or the VLAP Intern will download the data from the meter into a computer spreadsheet (Excel, Microsoft 2000). The data contained in the electronic spreadsheet will be compared to the field data sheet to verify the data.

In addition, starting with the 2002 sampling season, the VLAP Coordinator and the VLAP Intern will begin to document the location of stations at each lake/pond using the station identification form (Appendix C-9).

When volunteers or the VLAP Coordinator or VLAP Intern sample the lake and watershed, completed data forms and samples will be returned to the laboratory within 24 hours. The Satellite Laboratories will send a copy of the field data sheets to NHDES on a weekly basis during the sampling season. All information collected in the field by volunteers will be kept by NHDES for at least five years.

LABORATORY GENERATED DATA

Data from parameters analyzed with the meters in the Satellite Laboratories and the NHDES Limnology Center will be entered immediately upon analysis into meter-respective bench books. Data recordings will be made in blue or black ink. These data will then be entered weekly into the Limnology Center Log-In System at NHDES or the Satellite Laboratory and will be cross-referenced with bench book data upon printout. Personnel who enter and check data add their initials to the bench book for accountability purposes. These data entries and checks occur weekly. Examples of bench book data sheets are included in Appendix D-11.

Once a month during the sampling season, the Satellite Laboratories will email an electronic copy of their log-in system, which contains all of the sample data for the season to that point, to NHDES. NHDES will keep this data for at least 5 years.

Data analyzed in the NHDES Laboratory Services Unit are electronically sent to the Limnology Center log-in system database upon completion of analysis. Turnaround times for all samples are 30 days. Laboratory login sheets and custody sheets are returned as well and will be kept on

file. These data are already checked and verified by the Laboratory Services Unit for completeness. The Laboratory Services unit will keep all billing receipts and information for sample analysis.

Data analyzed by NHDES and the Satellite Laboratories will be sent out as monthly data reports during the sampling season on a monthly basis to the volunteer monitors that submitted samples that month. Specifically, the volunteer monitors receive a monthly data report (Refer to Appendix E-2) a parameter summary explanation (Refer to Appendix E-4), and a copy of the field data sheet that they submitted to the lab. In addition, a summary of the results and relative percent difference (RPD) calculations of the QC samples (field duplicates and trip blanks) will be included in the monthly report when the annual biologist visit was conducted (Refer to Appendix E-3).

After the end of the sampling season, all the raw data in the NHDES Limnology Center Log-In system, and the Satellite Laboratory Log-in systems, which will have already been verified for accuracy and completeness, will be imported into the VLAP historical database. This database stores all of the raw data generated for each lake/pond since it joined VLAP.

B10.2 Data Handling and Management Procedures

DATA STORAGE

Scott Ashley, the Biology Section Database Coordinator, will import all VLAP raw data from the NHDES Limnology Center Log-In system and the Satellite Laboratory Log-in systems into the VLAP database. In addition, the dissolved oxygen/temperature profile data for each lake/pond, which was downloaded from the meter into an Excel Spreadsheet (Microsoft Excel 2000) during the sampling season, will be imported into the VLAP historical database.

The VLAP historical database was designed using the FoxPro database software (FoxPro for Windows, Microsoft Corporation, 1989-1994, Version 2.6). This database stores all of the raw data generated for each lake/pond since it joined VLAP. The paper copies of the data sheets that contain the raw data results for each sampling event at each lake/pond will be kept on file at NHDES for at least 5 years in the event that data is lost from the database or if data needs to be verified at any time.

DATA TRANSFORMATIONS/DATA REDUCTION

The raw data for each lake/pond that participated in VLAP during the current year are reduced and analyzed statistically using the VLAP FoxPro database. Individual data tables are generated that show the current year and historical “maximum”, “minimum”, and “mean” values for chlorophyll-a, pH, ANC, conductivity, total phosphorus concentration, and turbidity for each lake/pond. A data table that lists the dominant phytoplankton species for the current year and historical years is generated. A data table for the current year temperature/do profile is generated. A data table that lists the current year and historical dissolved oxygen concentration and temperature in the bottom meter of the lake/pond is generated. And, finally, a data table that lists the current year *E.coli* concentrations is generated.

Data are transformed graphically using the Sigma Plot Scientific Graphical Software (Jandel Corporation, 1986-1994, version 2.01). Specifically, graphs are generated for the current year data (monthly data) and for historical data (all the data since the lake/pond joined VLAP) for chlorophyll-a, clarity (Secchi-disk transparency), and total phosphorus concentration for the upper layer and the lower layer (Refer to Appendix E-8). (Note: If more than one sample for a parameter is taken per month, the mean value for the parameter that month is graphed.)

Data transformations and reductions are conducted at the end of each sampling season. The data for each lake/pond that participated in the current sampling season are analyzed and current year and historical trends are characterized and discussed in an annual report for each lake/pond.

DATA TRANSFER/TRANSMITTAL

Data are frequently copied and pasted between various programs depending on the need for various statistical analyses and graphic capabilities of software. Transferred data are cross-referenced with original data.

DATA ANALYSIS

Using the FoxPro tables and Sigma Plot Graphs that are generated (and summarized in Table B10-2) for each lake/pond that participated in the current sampling season, the VLAP Coordinator and the VLAP Intern analyze the data to discern trends. Specifically, the data is visually analyzed to determine if there were any trends (either increases or decreases) in parameter values during the season, or if there was any correlation between parameters during the season. In addition, the current year and historical data is compared to determine if there have been any changes (either increases or decreased) in parameters since the lake/pond has been sampled in VLAP.

Table B10-1: Data Representation in VLAP “Bi-Annual Reports” and “Interim Reports”

Sampling Parameter	Fox Pro Data Tables (max, min, mean values represented)	Sigma Plot Graphs
Chlorophyll-a	historic and current year	current year data: monthly data historical data: mean value and standard deviation
Phytoplankton Species	historic and current year	Not graphically represented
Clarity (Secchi Disk Transparency)	historic and current year	current year data: monthly data historical data: mean value and standard deviation
pH	historic and current year	Not graphically represented
ANC	historic and current year	Not graphically represented
Conductivity	historic and current year	Not graphically represented
Total Phosphorus	historic and current year for each thermal layer	current year data: monthly data for upper and lower layer historical data: mean value and standard deviation
DO/Temperature profile	current year profile (each meter from surface to bottom)	Not graphically represented
Hypolimnion DO/temperature data	historic and current year bottom meter reading	Not graphically represented
Turbidity	historic and current year	Not graphically represented
E.coli	current year data (actual counts/100 mL)	Not graphically represented

Note: QC data and Relative Percent Difference (RPD) calculations for duplicate samples and trip blank samples are also provided in the reports.

Specifically, Sigma Plot graphs are generated for the current year and historical mean (with standard deviations) for chlorophyll-a, clarity (secchi disk transparency), and total phosphorus concentration in the upper and lower layer. For lakes/pond that have participated in VLAP for less than 10 years, the regression line and the scatter associated with the data on the graphs are visually inspected by the VLAP Coordinator or the VLAP Intern to determine if there has been a change in the annual mean value for parameters since monitoring began.

Since visually inspecting a graphical representation of a data set to conduct trend analysis is a subjective assessment, VLAP will be implementing a more rigorous statistical analysis for lakes/ponds that have participated in VLAP for at least 10 years. This change to the program will officially begin with the 2002 VLAP annual reports. Specifically, VLAP will use a simple linear regression statistical test to determine if there is enough evidence to “reject” the null hypothesis that the annual mean value for the water quality parameter of interest (chlorophyll-a concentration, clarity (Secchi-disk transparency), or total phosphorus concentration) **has not changed** during the time that that lake/pond has been sampled in VLAP. If there is enough evidence to “reject” the null hypothesis, then we will accept the alternative hypothesis, which says that the mean value **has changed** (either increased or decreased) during the time that that lake/pond has been sampled in VLAP. We will then figure out if the change is an increase or decrease, and we will determine the “strength” of the trend (Refer to Appendix E-9 for a more detailed explanation).

DATA ASSESSMENT

Data will be manually cross-referenced with bench book entries to verify accuracy in computer entry.

Statistical analyses will be verified through manual calculations.

Statistical computer programs to be used to analyze data were listed above in Data Analysis Section.

B10.3 Data Tracking and Control

DATA TRACKING

Data tracking is summarized in Appendix D-15 and Appendix E.

DATA STORAGE, ARCHIVAL, AND RETRIEVAL

All data are stored at NHDES in the following ways:

Hardcopies of data

- Lake Maps (showing sampling stations)
- Field Data Sheets
- Raw Data
- Monthly Data Reports
- Annual Reports

Electronic Copies of Data

Raw Data
Statistical Results
Annual Report

All data will be stored indefinitely by NHDES on a permanent network system that is backed-up nightly. Data will also be stored on diskettes. The Biology Section Database Coordinator, Scott Ashley, will package archived information.

DATA SECURITY

All data are public information and need not be secured.

C ASSESSMENT AND OVERSIGHT

C1 Assessments and Response Actions

C1.1 Planned Assessments

See Table C-1 for planned assessments for VLAP.

C1.2 Assessment Findings and Corrective Actions

FIELD ASSESSMENTS

Field Sampling Technical Systems Audit (TSA)-QAPP deviations and project deficiencies determined during the field sampling TSA will be evaluated for the source of deviation and corrected with verbal communications in the field. Any necessary written/structural changes will be made through a revision of the SOP for that activity. Field sampling activities will be monitored to determine compliance.

The training and assessment of the ability of the VLAP Intern to perform field sampling activities according to the Standard Operating Procedures is the responsibility of the VLAP Coordinator. At the start of each sampling season, the VLAP Coordinator will first train (or re-train, if the VLAP Intern was also the Intern the previous season) the VLAP Intern in the proper field sampling Standard Operating Procedures, as outlined in Appendix C. After the Intern has been trained, the VLAP Coordinator will “assess” the Intern’s field sampling performance using the “NHDES VLAP Intern Field Sampling Procedures Training Assessment Audit Evaluation Form” (Refer to Appendix B-4), prior to the Intern sampling on his/her own with the volunteer monitors. The VLAP Intern will not be allowed to sample on his/her own with the volunteers until all sampling tasks are performed successfully on at least three occasions (Refer to Appendix B-4).

The assessment of volunteer monitors field sampling performance is the responsibility of the VLAP Coordinator and the VLAP Intern during the annual visit with each monitoring group at their lake/pond. Using the “NHDES VLAP Volunteer Monitor Field Sampling Procedures Training Assessment Audit Form” (Refer to Appendix B-4), the VLAP Coordinator or the VLAP Intern will assess the ability of the volunteer monitors to follow the standard operating procedures for field sampling (as outlined in the VLAP Monitor’s Manual which can be found in Appendix C-2). Any sampling procedure deficiencies will be documented and volunteers in need of performance improvement will be retrained on-site during the annual visit. In addition, volunteers are strongly encouraged to attend the Annual VLAP Refresher Workshop, which is typically held just prior to the start of the sampling season to retrain volunteer monitors in the proper use of sampling equipment (Refer to Appendix B-5 for a sample announcement).

In addition, when volunteer monitors sample on their own without the VLAP Coordinator or VLAP Intern and then drop samples off at the lab, the lab staff will use the “VLAP Sample Receipt Checklist” (Refer to Appendix D-14) to identify any field sampling standard operating procedures that were not followed by the volunteer monitors. The sampling deficiencies will be

noted on the sample receipt checklist, in the sample log-in system, and, if necessary, samples will be rejected for analysis. In addition, the volunteer monitors will be contacted by the VLAP Coordinator or VLAP Intern about sampling deficiencies as soon as possible, in order to minimize, and hopefully to eliminate, any future sampling deficiencies.

If errors in sampling techniques are consistently identified in the field or when samples are brought into the lab, retraining of volunteer monitors may be scheduled more frequently.

LABORATORY ASSESSMENTS

Limnology Center and VLAP Satellite Fixed Laboratory TSA-QAPP deviations and project deficiencies determined during the Limnology Center and VLAP Satellite fixed laboratory TSA will be addressed immediately. Duplicate acceptance criteria will be checked with data to determine if sources of error exist. Data will be entered into the computer weekly and cross-referenced with bench books for accuracy. Any deviations in results will be addressed in both written and verbal formats, and future sampling will be monitored to verify that compliance is reached.

NHDES Laboratory Services Fixed Laboratory TSA-QAPP deviations and project deficiencies determined during the NHDES Laboratory Services fixed laboratory TSA will be addressed immediately. Replicates and critical range tables will be checked with data to determine if sources of error exist. Data will be entered into the computer weekly and cross-referenced with bench books for accuracy. Any deviations in results will be addressed in both written and verbal formats, and future sampling will be monitored to verify that compliance is reached.

All field and laboratory activities may be reviewed by state and EPA quality assurance officers as required.

COMBINED FIELD & LABORATORY ASSESSMENTS

Field duplicate and trip blank samples will be assessed as part of the fixed laboratory and field TSA on a weekly basis. The TSA will occur prior to the sampling data being sent to the volunteer monitors. Lab data for the field duplicates and trip blanks will be compared to project acceptance criteria. Any deviations in results will be addressed in both written and verbal formats, and future sampling and analysis will be monitored to verify that compliance is reached.

C1.3 Additional QAPP Non-Conformances

Corrective actions will be implemented any time that deviations or errors are noted in field and laboratory work during the project.

Table C1-1: Project Assessment Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) responsible for performing assessment, title and organizational affiliation	Person(s) responsible for responding to assessment findings, title and organizational affiliation	Person (s) responsible for identifying and implementing corrective actions (CA), title and organizational affiliation	Person (s) responsible for monitoring effectiveness of CA, title and organizational affiliation
Field Sampling TSA (review of volunteer monitor sampling performance)	Once per season on annual biologist visit to lake/pond	Internal	NHDES	Andrea LaMoreaux VLAP Coordinator NHDES or VLAP Intern	Andrea LaMoreaux VLAP Coordinator NHDES or VLAP Intern	Andrea LaMoreaux VLAP Coordinator NHDES or VLAP Intern	Andrea LaMoreaux VLAP Coordinator NHDES
Field Sampling TSA (review of VLAP Intern sampling performance)	At least three times at beginning of season prior to sampling on own with the volunteer monitors	Internal	NHDES	Andrea LaMoreaux VLAP Coordinator NHDES	Andrea LaMoreaux VLAP Coordinator NHDES	Andrea LaMoreaux VLAP Coordinator NHDES	Andrea LaMoreaux VLAP Coordinator NHDES
Field Analytical TSA (DO/Temp profile)	One per week by	Internal	NHDES	Andrea LaMoreaux VLAP Coordinator and VLAP Intern NHDES	Andrea LaMoreaux VLAP Coordinator NHDES	Andrea LaMoreaux VLAP Coordinator NHDES	Andrea LaMoreaux VLAP Coordinator NHDES
Limnology Center Fixed Lab TSA	Weekly	Internal	NHDES	Andrew Chapman QA/QC Officer NHDES	Andrew Chapman QA/QC Officer NHDES	Andrew Chapman QA/QC Officer NHDES	Andrew Chapman QA/QC Officer NHDES

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) responsible for performing assessment, title and organizational affiliation	Person(s) responsible for responding to assessment findings, title and organizational affiliation	Person (s) responsible for identifying and implementing corrective actions (CA), title and organizational affiliation	Person (s) responsible for monitoring effectiveness of CA, title and organizational affiliation
Satellite Laboratory Fixed Lab TSA	Annual	Internal	NHDES	Andrew Chapman QA/QC Officer NHDES	Andrew Chapman QA/QC Officer NHDES	Andrew Chapman QA/QC Officer NHDES	Andrew Chapman QA/QC Officer NHDES
	Weekly	Internal	Lake Sunapee Regional Lab	Bonnie Lewis Lab Manager Lake Sunapee Regional Lab	Bonnie Lewis Lab Manager Lake Sunapee Regional Lab	Bonnie Lewis Lab Manager Lake Sunapee Regional Lab	Bonnie Lewis Lab Manager Lake Sunapee Regional Lab
	Weekly	Internal	Franklin Pierce College Satellite Lab	Sue Roulke Lab Manager Franklin Pierce Lab	Sue Roulke Lab Manager Franklin Pierce Lab	Sue Roulke Lab Manager Franklin Pierce Lab	Sue Roulke Lab Manager Franklin Pierce Lab
NHDES Laboratory Services Fixed Lab TSA	Weekly	Internal	NHDES	Rachel Rainey Chem Lab QA/QC Officer NHDES	Rachel Rainey Chem Lab QA/QC Officer NHDES	Rachel Rainey Chem Lab QA/QC Officer NHDES	Rachel Rainey Chem Lab QA/QC Officer NHDES

C2 Reports to Management

No program specific QA Management Reports will be generated for VLAP. In lieu of frequent QA Management Reports, a VLAP QA/QC section will be included in the annual NHDES Limnology Center QA/QC report prepared by the Limnology Center QA/QC Officer, and will include the following items:

- Number of lakes/ponds sampled
- Number of stations sampled
- Number of sample results generated
- Summary of project QA/QC programs and trainings conducted during the season
- Conformance of project activities to QAPP requirements/procedures
- Problems that were encountered during the sampling season and proposed solutions to these problems that will be implemented during the next sampling season.
- Deviations from the approved QAPP and approved amendments to the QAPP
- Results and trends of performance evaluations by laboratory (per parameter, matrix and concentration level)
- Description and findings of TSAs and other assessments
- Results of data validation activities in terms of amount of usable data generated
- Required corrective actions and effectiveness of corrective action implementation
- Data quality assessments in terms of precision, accuracy, representativeness, completeness, comparability, and sensitivity
- Limitations on the use of measurement data generation

The Annual NHDES Limnology Center QA/QA Report will be provided to NHDES Limnology Center staff, DES QA Manager, upper management at NHDES, and representatives of the EPA, as listed in Table C2-1.

Table C2-1: NHDES Limnology Center Annual QA/QC Report Distribution List

Individual/Title	Agency	Contact Information
Dana Bisbee Acting Commissioner	NHDES	dbisbee@des.state.nh.us
Harry Stewart Water Division Director	NHDES	hstewart@des.state.nh.us
Paul Currier Watershed Management Bureau Administrator	NHDES	pcurrier@des.state.nh.us
Chuck Knox Public Information Center	NHDES	cknox@des.state.nh.us
Peter Nolan EPA Chelmsford Lab	EPA	nolan.peter@epa.gov
Robert Estabrook Chief Aquatic Biologist	NHDES	restabrook@des.state.nh.us
Vince Perelli DES QA Manager	NHDES	vperelli@des.state.nh.us
Andrew Chapman Biology Section QA Officer	NHDES	achapman@des.state.nh.us
Jody Connor Limnology Center Director	NHDES	jconor@des.state.nh.us
NHDES Limnology Center Staff	NHDES	various
Andrea LaMoreaux VLAP Coordinator	NHDES	alamoreaux@des.state.nh.us

Though frequent QA management reports will not be generated, frequent reviews of data (as described in Section C1) will be conducted to determine sampling efficiency.

In addition, for each lake/pond, a QA management section will be included in the annual report. This section will summarize the results of the annual assessment audit of the volunteer monitors' ability to perform field sampling activities according to the standard operating procedures, will document any sampling procedure deficiencies when volunteer monitors sampled on their own and dropped off samples at the lab, and will document any corrective actions that were made or need to be made to minimize and hopefully to eliminate, sampling procedure deficiencies in the future. In addition, the QA section of each lake's annual report will also summarize how duplicate samples results met/did not meet the program QA requirements.

D DATA VALIDATION AND USABILITY

D1 Data Review, Verification, and Validation

The Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses will not be used for this project.

Data validation will occur through the detailed examination of raw data to check for calculation, compound identification, and transcription errors. Data of known and documented quality will be provided from this examination.

In addition, the results of QC checks and samples, analytical procedures and performance evaluation sample results will be assessed and applied to statistical tests.

These data examinations are essentially those used in Tier II and Tier III, however, the exact protocols of The Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses will not be used.

D2 Verification and Validation Methods

VERIFICATION

Table D2-1 describes the process that will be followed to verify and validate data.

Table D2-1: Data Verification Process

Verification Task	Description	I/E	Responsible for Verification
Field Data/Field Notes	Field data sheets will be collected at the end of each sampling event and analyzed for completeness and accuracy.	I	Andrea LaMoreaux, VLAP Coordinator NHDES VLAP Intern NHDES NHDES Limnology Center Personnel Satellite Lab Managers Satellite Lab Interns
NHDES Limnology Center Data	Applicable data will be subject to 10% duplicate analysis and acceptance criteria in the lab. The QA/QC officer will check the accuracy of these samples. Lab personnel will conduct data entry and comparison to bench book data.	I	Andrew Chapman NHDES Laboratory Personnel NHDES
Satellite Laboratories	Applicable data will be subject to 10% duplicate analysis and acceptance criteria in the lab. The satellite lab manager will check the accuracy of these samples. The results of these checks will be reported to the NHDES QA/QA Limnology Center Officer. Satellite Lab interns will conduct data entry and comparison to bench book data.	I	Andrew Chapman NHDES Satellite Laboratory Managers Satellite Laboratory Interns
NHDES Laboratory Services Unit Data	Data generated in this laboratory will be checked by the laboratory QC personnel and then transferred to the Limnology Database where it will also be checked by the VLAP Coordinator.	I/E	Rachel Rainey NHDES Laboratory Services Andrea LaMoreaux NHDES
“Bi-Annual Reports” and “Interim Reports” Data Analyses and Recommendations	The annual report for each lake/pond will be analyzed for content, accuracy, and for types of recommendations made for sampling activities, QA issues, and water quality problems revealed during each sampling season.	I	Jody Connor NHDES

Key:

I = Internal
E = External

VALIDATION

Table D2-2 summarizes which sampling, handling, field analytical and fixed laboratory data will be validated.

Table D2-2: Data Validation Summary Table

Medium/ Matrix	Analytical Parameter	Validation Criteria	Validation Criteria Modified	Data Validation Tier Level	Modified Tier Level Used	Data Validator (Name, title and organizational affiliation)	Responsibility for Data Validations (Name, title and organizational affiliation)
Surface Water	Total Phosphorus	See description of validation criteria discussed in Section D1	Y	See description in Section D1	Y	Rachel Rainey NHDES Laboratory Services 603-271-2993	Andrew Chapman NHDES QA/QC Officer 603-271-5334
						Bonnie Lewis Lake Sunapee Regional Lab 603-526-3486	
						Sue Rolke Lab Manager 2002 Franklin Pierce Laboratory 603-899-1045	
Surface Water	E.coli	See description of validation criteria discussed in Section D1	Y	See description in Section D1	Y	Rachel Rainey NHDES Laboratory Services 603-271-2993	Andrew Chapman NHDES QA/QC Officer 603-271-5334
						Bonnie Lewis Lake Sunapee Regional Lab 603-526-3486	
						Sue Rolke Lab Manager 2002 Franklin Pierce Laboratory 603-899-1045	

Medium/ Matrix	Analytical Parameter	Validation Criteria	Validation Criteria Modified	Data Validation Tier Level	Modified Tier Level Used	Data Validator (Name, title and organizational affiliation)	Responsibility for Data Validations (Name, title and organizational affiliation)
Surface Water	Turbidity Conductivity pH Chlorophyll-a ANC	See description of validation criteria discussed in Section D1	Y	See description in Section D1	Y	Bonnie Lewis Lake Sunapee Regional Lab 603-526-3486	Andrew Chapman NHDES QA/QC Officer 603-271-5334
						Sue Rolke Franklin Pierce Laboratory 603-899-1045	
						Andrew Chapman NHDES QA/QC Officer 603-271-5334	
Surface Water	Plankton	See description of validation criteria discussed in Section D1	Y	See description in Section D1	Y	Andrew Chapman NHDES QA/QC Officer 603-271-5334	Andrew Chapman NHDES QA/QC Officer 603-271-5334
Surface Water	Dissolved Oxygen/Temp	See description of validation criteria discussed in Section D1	Y	See description in Section D1	Y	Andrea LaMoreaux VLAP Coordinator, NHDES 603-271-2658	Andrew Chapman NHDES QA/QC Officer 603-271-5334

Table D2-3 summarizes Data Validation Modifications.

Table D2-3: Data Validation Modifications

Modifications
<ul style="list-style-type: none"> • Mixing of Tiers II and III were done to modify the validation methods to be comparable to those used by NHDES. • Tier I components are not done by NHDES Limnology Center.

D3 Reconciliation with User Requirements

Critical environmental decisions will not be made as a result of this program. The NHDES VLAP program is specifically designed to train volunteer monitors on how to sample the lake/pond that they live near. Volunteer monitoring leads to local education and awareness of land use and human practices that may be detrimental to lake quality and also empowers communities in their decision-making regarding lake management issues. Regular sample collection from the lake and the streams that enter it also builds a strong set of baseline water quality data. By sampling the lake several times each year over a period of years, long-term water quality trends can be discerned. Such monitoring results in the early detection of water quality changes. This allows NHDES to trace potential problems to their source before a severe negative impact can be made on the lake. Over time, baseline data is used to determine long-term trends in lake water quality as well. Such data is an invaluable resource in maintaining federal lakes funding, and in NHDES' mission to assess and protect New Hampshire's lakes.

D3.1 Data Review

This program does not follow the formal DQO process, so section D3 is not entirely applicable. Throughout the sampling season, calculations and determinations for precision, completeness, and accuracy will be made and corrective action implemented, if necessary. The following items address some aspects of data review.

PRECISION

Limnology Center and VLAP Satellite Fixed Laboratory Technical Systems Audit (TSA)-QAPP deviations and project deficiencies determined during the Limnology Center and VLAP Satellite fixed laboratory TSA will be addressed immediately. Duplicate acceptance criteria will be checked with data to determine if sources of error exist. Data will be entered into the computer weekly and cross-referenced with bench books for accuracy. Any deviations in results will be addressed in both written and verbal formats, and future sampling will be monitored to verify that compliance is reached.

NHDES Laboratory Services Fixed Laboratory Technical Systems Audit-QAPP deviations and project deficiencies determined during the NHDES Laboratory Services fixed laboratory TSA will be addressed immediately. Replicates and critical range tables will be checked with data to determine if sources of error exist. Data will be entered into the computer weekly and cross-

referenced with bench books for accuracy. Any deviations in results will be addressed in both written and verbal formats, and future sampling will be monitored to verify that compliance is reached.

ACCURACY/BIAS

Sample Contamination:

Sample contamination will be addressed through field trip blanks and laboratory blanks.

Analytical Accuracy/Bias:

Analytical accuracy will be addressed through CCV, initial calibrations, and instrument blank and spike analyses.

Overall Accuracy/Bias:

Data will be compared with project DQOs to determine overall accuracy/bias conformance.

COMPLETENESS

Since VLAP only recommends, and does not require that groups collect samples three times a year, adequate completeness will be set at 75% of participating lakes collecting more than twice per year.

SAMPLE REPRESENTATIVENESS

Field sampling SOPs will be strictly adhered to. If variation in sample results occurs, stream bracketing or repeat sampling may take place to ensure sample representativeness.

COMPARABILITY

Data will be manually compared to measurement performance criteria. If samples are not acceptable they will not be included in the calculations performed each season. See Section A7.2.

D3.2 Data Limitations and Actions

When data do not meet acceptable standards they will be flagged and omitted from calculations in the annual report and will be noted. If the data set is limited, and questionable data must be used, they will be used for reference only, and will be footnoted that data are questionable.

The cause of failure will be evaluated. If the cause is found to be sampling error, volunteers will be retrained. If the cause is found to be equipment failure, calibration/maintenance techniques will be reassessed and improved.

If failure to meet program specifications is found to be unrelated to equipment, methods, or sample error, specifications may be revised for the next sampling season. Revisions will be submitted to the EPA Quality Assurance Officer for approval.

1. Identify Guidance used to prepare QAPP: EPA Requirements for Quality Assurance Project Plans EPA QA/R-5, Final March 2001
2. Identify EPA Program: NHDES VLAP does not receive EPA funding, only state funding
3. Identify approval entity: EPA-NE or State: Since VLAP receives state funding and no EPA funding, review by the EPA is not required. However, we are requesting that EPA review this QAPP.
4. Indicate whether the QAPP is a **generic program QAPP** or a Project specific QAPP. (underline one)
5. List dates of scoping meetings that were held: N/A
6. List title of QAPP documents and approval dates written for previous site work, if applicable: N/A
Title: N/A Approval Date: N/A
7. List organizational partners (stakeholders) and connection with EPA and/or State:
NH Department of Environmental Services, Water Division, Biology Section
Colby Sawyer College, Lake Sunapee Regional Lab, Franklin Pierce College Laboratory
Volunteer Monitors throughout New Hampshire
8. List data users:
NH Department of Environmental Services, Volunteer Monitors throughout New Hampshire, EPA
New England, Team New Hampshire
9. If any required QAPP Elements (1-20), Worksheets and/or Required Information are not applicable to the project, then circle the omitted QAPP Elements, Worksheets and Required Information on the attached Table. Provide an explanation for their exclusion below:
 - Project Scoping Meeting Attendance Sheet with Agenda and other Project Planning Meeting Documentation** – *This project is actually a program that has been in existence at the NHDES since 1985, therefore this does not apply.*
 - EPA-NE DQO Summary Form** – *This form is not included.*
 - Site Maps (historical and present)** – *The individual maps for each of the 141 lakes currently participating in VLAP are not included in this packet since it would be cumbersome. In addition, unknown lakes/ponds are expected to join the program in the future.*
 - **Field Screening/Confirmatory Analysis Decision Tree** – *No field screening is conducted in VLAP.*
 - **Non-Direct Measurements Criteria and Limitations Table** – *Not Applicable since the only non-direct measurement of data used in conjunction with VLAP is lake bathymetric maps generated by the NHDES Lake Survey Program.*
 - QA Management Reports (Worksheet #28)** – *Will not be included because these reports will not be prepared during the course of the program. The NHDES Limnology Center QA/QC Officer prepares a separate report each year which includes the information for VLAP.*

EPA-NE QAPP Worksheet 2

Required EPA QA/R-5 QAPP Elements	Required EPA-NE QAPP Elements and Corresponding EPA-NE QAPP Sections	EPA-NE QAPP Worksheet #	Required Information
Project Management and Objectives			
A1	1.0 Title and Approval Page	1	-Title and Approval Page
A2	2.0 Table of Contents and Document Format 2.1 Table of Contents 2.2 Document Control Format 2.3 Document Control Numbering System 2.4 EPA-NE QAPP Worksheet #2	2	-Table of Contents -EPA-NE QAPP Worksheet
A3	3.0 Distribution List and Project Personnel Sign-off Sheet	3 4	-Distribution List -Project Personnel Sign-off Sheet
A4, A8	4.0 Project Organization 4.1 Project Organizational Chart 4.2 Communication Pathways 4.2.1 Modifications to Approved QAPP 4.3 Personnel Responsibilities and Qualifications 4.4 Special Training Requirements/ Certification	5a 5b 6 7	-Organizational Chart -Communication Pathways -Personnel Responsibilities and Qualifications Table -Special Personnel Training Requirements Table
A5	5.0 Project Planning/Project Definition 5.1 Project Planning Meetings 5.2 Problem Definition/Site History and Background	8a 8b	<u>-Project Scoping Meeting Attendance Sheet with Agenda and other Project Planning Meeting Documentation</u> -Problem Definition/Site History and Background <u>-EPA-NE DQO Summary Form</u> <u>-Site Maps (historical and present)</u>
A6	6.0 Project Description and Schedule 6.1 Project Overview 6.2 Project Schedule	9a 9b 9c 9d 10	-Project Description -Contaminants of Concern and Other Target Analytes Table (<i>Table A6-1</i>) -Field and Quality Control Sample Summary Table (<i>Table A6-2</i>) -Analytical Services Table (<i>Table A6-3</i>) -System Designs -Project Schedule Timeline Table (<i>Table A6-4, A6-5, A6-6</i>)
A7	7.0 Project Quality Objectives and Measurement Performance Criteria 7.1 Project Quality Objectives 7.2 Measurement Performance Criteria	11a 11b	-Project Quality Objectives/Decision Statements -Measurement Performance Criteria Table (<i>Table A7-1</i>)

Measurement/Data Acquisition				
B1	8.0 Sampling Process Design 8.1 Sampling Design Rationale	12a 12b	-Sampling Design and Rationale -Sampling Locations, Sampling and Analysis Method/SOP Requirements Table (<i>Table B1-1</i>) -Sample Location Map	
B2, B6, B7, B8	9.0 Sampling Procedures and Requirements 9.1 Sampling Procedures 9.2 Sampling SOP Modifications 9.3 Cleaning and Decontamination of Equipment/Sample Containers 9.4 Field Equipment Calibration 9.5 Field Equipment Maintenance, Testing and Inspection Requirements 9.6 Inspection and Acceptance Requirements for Supplies/Sample Containers	13 12b 14 15	-Sampling SOPs (<i>Appendix C</i>) -Project Sampling SOP Reference Table (<i>Table B2-1</i>) -Sampling Container, Volumes and Preservation Table (<i>Table B1-1</i>) -Field Sampling Equipment Calibration Table (<i>Table B7-1</i>) -Cleaning and Decontamination SOPs (<i>Appendix D</i>) -Field Equipment Maintenance, Testing and Inspection Table (<i>Table B6-1</i>)	
B3	10.0 Sample Handling, Tracking and Custody Requirements 10.1 Sample Collection Documentation 10.1.1 Field Notes 10.1.2 Field Documentation Management System 10.2 Sample Handling and Tracking System 10.3 Sample Custody	16	-Sample Handling, Tracking and Custody SOPs (<i>Appendix D</i>) -Sample Handling Flow Diagram -Sample Container Label (Sample Tag) (<i>Appendix D</i>) -Chain-of-Custody Form and Seal (<i>Appendix D</i>)	
B4, B6, B7, B8	11.0 Field Analytical Method Requirements 11.1 Field Analytical Methods and SOPs 11.2 Field Analytical Method/SOP Modifications 11.3 Field Analytical Instrument Calibration 11.4 Field Analytical Instrument/ Equipment Maintenance, Testing and Inspection Requirements 11.5 Field Analytical Inspection and Acceptance Requirements for Supplies	17 18 19	-Field Analytical Methods/SOPs (<i>Appendix C</i>) -Field Analytical Method/SOP Reference Table (<i>Table B4-1</i>) -Field Analytical Instrument Calibration Table (<i>Table B7-1</i>) -Field Analytical Instrument/Equipment Maintenance, Testing and Inspection Table (<i>Table B6-1</i>)	

B4, B6, B7, B8	12.0 Fixed Laboratory Analytical Method Requirements 12.1 Fixed Laboratory Analytical Methods and SOPs 12.2 Fixed Laboratory Analytical Method/SOP Modifications 12.3 Fixed Laboratory Instrument Calibration 12.4 Fixed Laboratory Instrument/ Equipment Maintenance, Testing and Inspection Requirements 12.5 Fixed Laboratory Inspection and Acceptance Requirements for Supplies	20 21	-Fixed Laboratory Analytical Methods/SOPs (<i>Appendix D</i>) -Fixed Laboratory Analytical Method/SOP Reference Table (<i>Table B4-2</i>) -Fixed Laboratory Instrument Maintenance and Calibration Table (<i>Table B7-2</i>)
B5	13.0 Quality Control Requirements 13.1 Sampling Quality Control 13.2 Analytical Quality Control 13.2.1 Field Analytical QC 13.2.2 Fixed Laboratory QC	22a 22b 23a 23b 24a 24b	Sampling -Field Sampling QC Table (<i>Table B5-1</i>) -Field Sampling QC Table cont. Analytical -Field Analytical QC Table (<i>Table B5-2</i>) -Field Analytical QC Table cont. -Field Screening/Confirmatory Analysis Decision Tree -Fixed Laboratory Analytical QC Sample Table (<i>Table B5-3A – H</i>) -Fixed Laboratory Analytical QC Sample Table cont.
B9	14.0 Data Acquisition Requirements	25	<u>-Non-Direct Measurements Criteria and Limitations Table</u>
A9, B10	15.0 Documentation, Records and Data Management 15.1 Project Documentation and Records 15.2 Field Analysis Data Package Deliverables 15.3 Fixed Laboratory Data Package Deliverables 15.4 Data Reporting Formats 15.5 Data Handling and Management 15.6 Data Tracking and Control	26	-Project Documentation and Records Table (<i>Table B10-1</i>) -Data Management SOPs (<i>Appendix D and Appendix E</i>)
Assessment/Oversight			
C1	16.0 Assessments and Response Actions 16.1 Planned Assessments 16.2 Assessment Findings and Corrective Action Responses 16.3 Additional QAPP Non-Conformances	27a 27b 27c	-Assessment and Response Actions -Project Assessment Table (<i>Table C1-1</i>) -Project Assessment Plan -Audit Checklists
C2	17.0 QA Management Reports	28	-QA Management Reports Table (<i>Table C2-1</i>)

Data Validation and Usability			
D1	18.0 Verification and Validation Requirements		-Validation Criteria Documents
D2	19.0 Verification and Validation Procedures	29a 29b 29c	-Data Evaluation Process (<i>Table D2-1</i>) -Data Validation Summary Table (<i>Table D2-2</i>) -Data Validation Modifications (<i>Table D2-3</i>)
D3	20.0 Data Usability/Reconciliation with Project Quality Objectives	30	-Data Usability Assessment